WATER WORKS & SEWERAGE

A GILLETTE PUBLICATION

L. H. Enslow
EDITOR

JUNE, 1938
VOLUME 85, No. 6

EVERYBODY'S TALKING ABOUT

The PITTSBURGH IMO WATER METER

The first practical innovation in domestic water meter design and construction to be offered the American Water Works trade in over 50 years.

The Sensation at the A. W. W. A. Convention in New Orleans

Write for Catalog

PITTSBURGH EQUITABLE METER COMPANY
MERCO NORDSTROM VALVE CO.
NEW YORK BUFFALO PHILADELPHIA KANSAS CITY DENVER LOS ANGELES Main Offices PITTSBURGH PA DES MOINES CHICAGO COLUMBUS MEMPHIS HOUSTON

WE have large and resourceful facilities for the production of large diameter pipe, large fittings and large special castings in gray or alloy iron. Design experience, accumulated over the past 37 years, fortifies plant equipment adequate to meet unusual requirements in production and deliveries. The products of this Company, listed below, provide a complete service in long-lived cast iron pipe and fittings for water, gas, sewerage, drainage and industrial uses. Stocks of standard pipe and fittings are maintained at 15 shipping points for quick delivery.

SUPER-DE LAVAUD CENTRIFUGAL CAST IRON PIPE

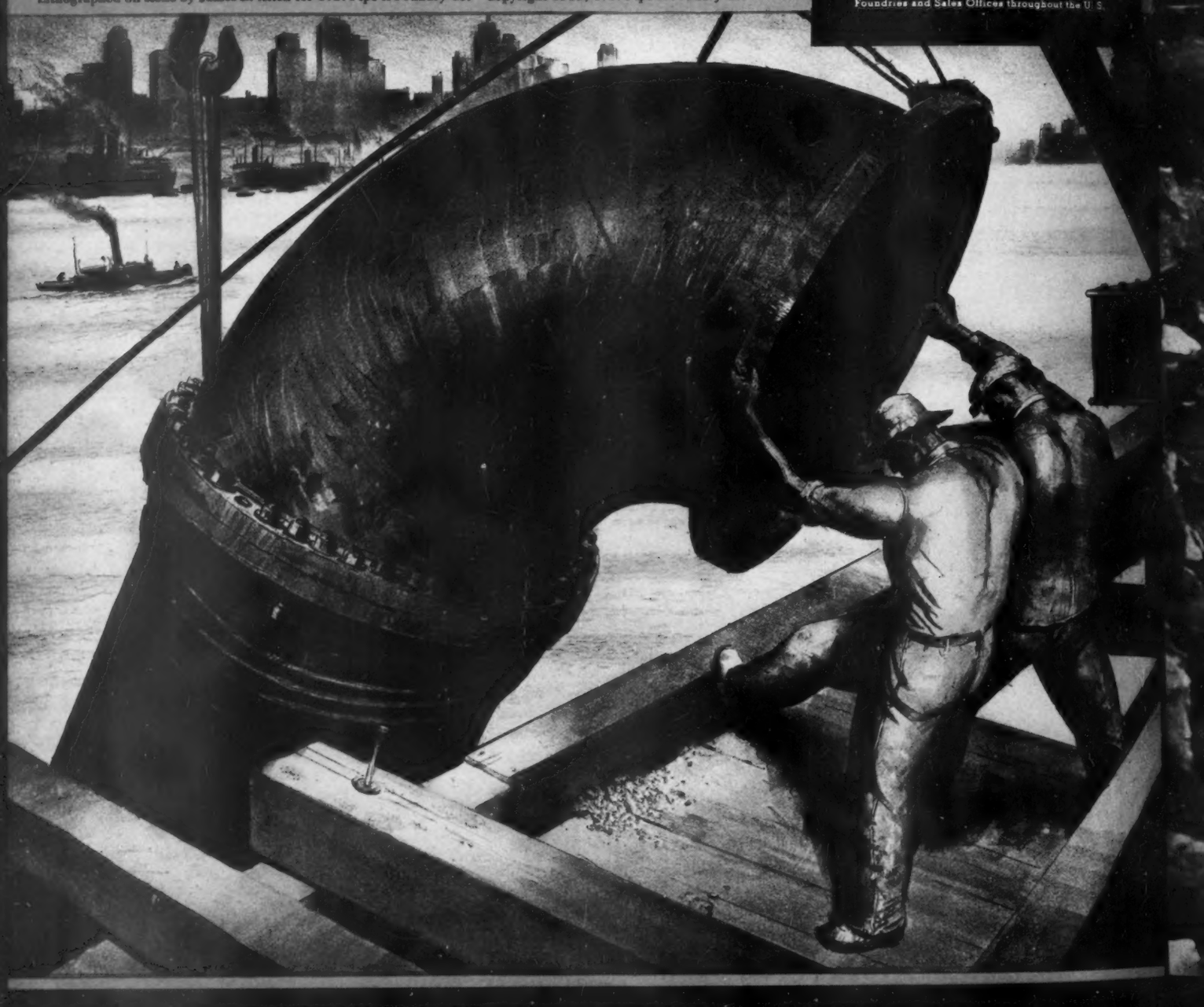
U. S. Pit Cast Pipe
U. S. Threaded Cast Iron Pipe
U. S. Cast Iron Culverts
Alloy and Gray Iron Castings
U. S. Mechanical Joint Pipe
U. S. Ni-Resist Cast Iron Pipe
U. S. Flexible Joint Pipe
U. S. Cast Iron Roof Plates

Lithographed on stone by James E. Allen for U. S. Pipe & Foundry Co. Copyright 1938, U. S. Pipe & Foundry Co.

cast iron

Cast iron and alloy cast iron pipe centrifugally or pit cast—for water works, gas, sewerage and drainage service as well as industrial uses involving corrosives.

U. S. PIPE & FOUNDRY CO.
BURLINGTON, NEW JERSEY
Foundries and Sales Offices throughout the U. S.



BEREA, OHIO

Dresser flexible Couplings were used to provide pressure tightness, and permitted easier conformity of pipe to topography, on this three-line inverted siphon carrying sewage across deep gorge. The three lines (6", 8", 12") were laid in trenches excavated in precipitous rock banks. Consulting Engineer: Rollin F. MacDowell (Cleveland). Contractor: The Phillips Construction Co. (Cleveland).

PUZZLED

about joints for that new sewage line?

. . . write Dresser!

Every sewage-line project—whether raw-sewage, sludge, outfall, air, water-supply, or even inside piping—brings up special problems of tightness, ease of joint-making, type of labor, strength, permanence, costs, etc. In solving these problems, the modern trend is to Dresser Couplings. They give you the *combined* advantages of Permanent Tightness, Flexibility, Simplicity, Speed, Strength, and *True* Economy . . .

SEND TODAY for our general catalog No. 36 . . . a handbook of pipe-line construction!

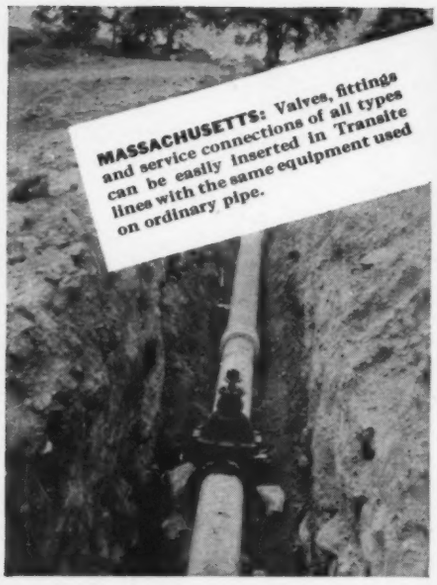
Dresser Catalog No. 36

DRESSER
PIPE COUPLINGS

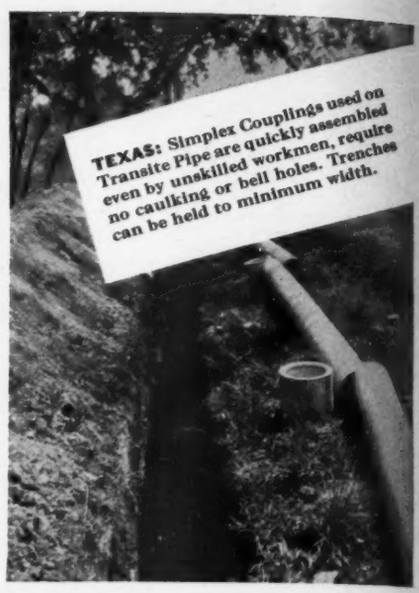
Cross section of Dresser Steel Coupling, Style 38, showing how it joins plain-end pipe in a flexible but permanently tight connection. Sizes available: ¾" I.D. to the largest pipe produced.

S. R. DRESSER MFG. COMPANY, BRADFORD, PA. New York: 230 Park Ave.; Chicago: Peoples Gas Bldg.; Houston: Shell Bldg.; San Francisco: 1038 Polk St.; In Canada: Dresser Mfg. Co., Ltd., 60 Front St., W., Toronto, Ont.

INDIANA: Transite Pipe is a mineral product, inherently permanent. Its asbestos-cement composition offers high resistance to both internal and external corrosion, keeps operating and maintenance costs low.

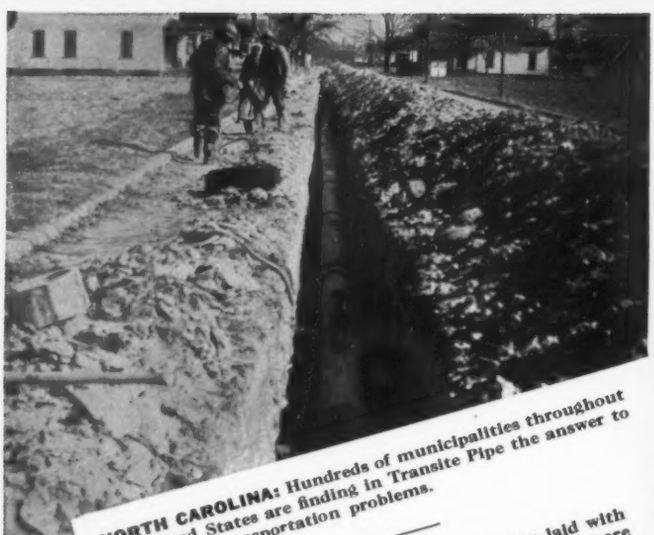


MASSACHUSETTS: Valves, fittings and service connections of all types can be easily inserted in Transite lines with the same equipment used on ordinary pipe.



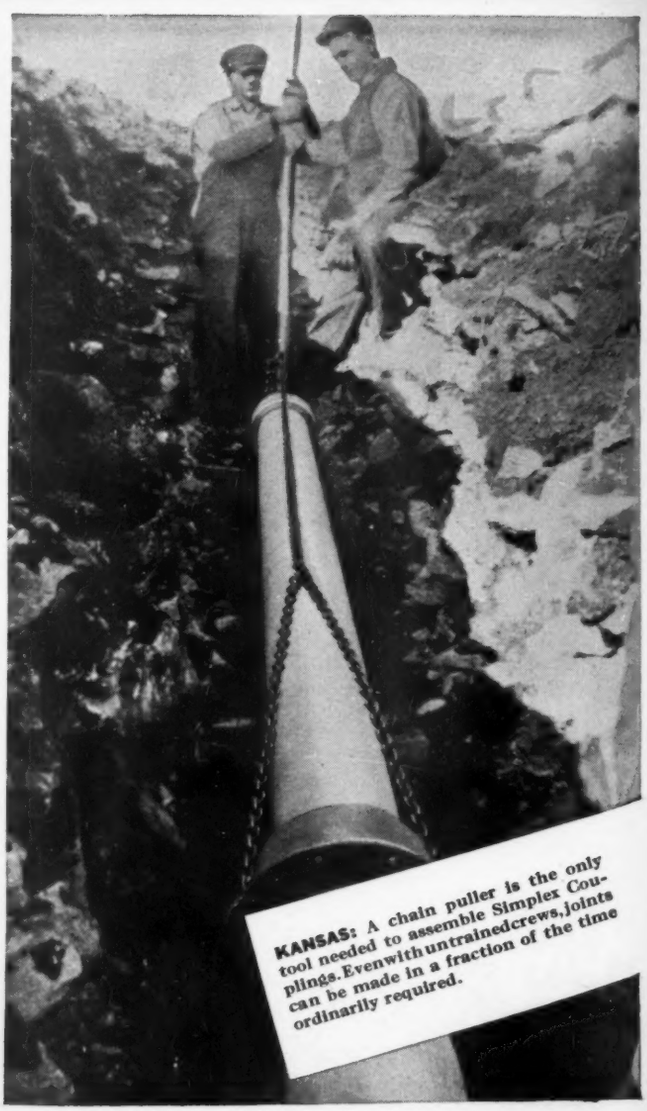
TEXAS: Simplex Couplings used on Transite Pipe are quickly assembled even by unskilled workmen, require no caulking or bell holes. Trenches can be held to minimum width.

SAVINGS JUST STARTING



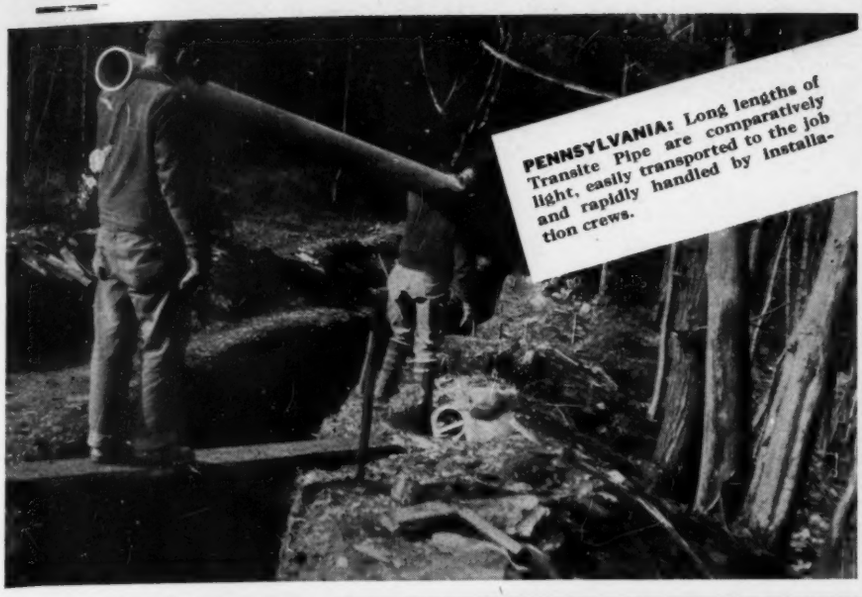
NORTH CAROLINA: Hundreds of municipalities throughout the United States are finding in Transite Pipe the answer to their water-transportation problems.

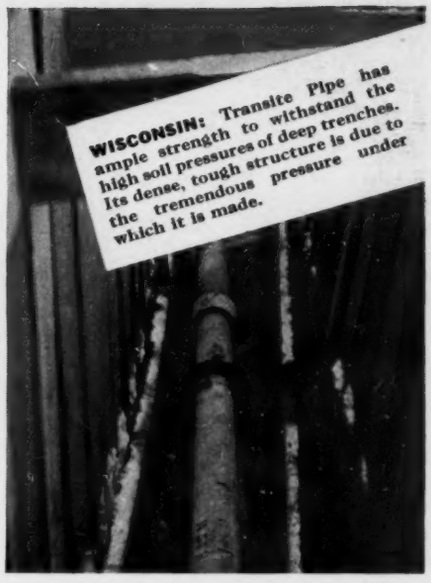
MASSACHUSETTS: Long sweeps can easily be laid with straight lengths of Transite Pipe. The Simplex Joints are flexible, yet remain permanently bottle-tight.



KANSAS: A chain puller is the only tool needed to assemble Simplex Couplings. Even with untrained crews, joints can be made in a fraction of the time ordinarily required.

WATER WORKS AND SEWERAGE, June, 1938. Volume 85. Number 6. Published monthly at 330 South Wells Street, Chicago, Ill., by the Gillette Publishing Company. Per copy, 25c. Subscription rate, $2.00 per year; Foreign, $3.00 per year. Copyright, 1938. Entered as Second Class Matter, June 2, 1931, at the Post Office at Chicago, Ill., under the Act of March 3, 1879.


PENNSYLVANIA: Long lengths of Transite Pipe are comparatively light, easily transported to the job and rapidly handled by installation crews.


WISCONSIN: Transite Pipe has ample strength to withstand the high soil pressures of deep trenches. Its dense, tough structure is due to the tremendous pressure under which it is made.

ON THESE 10 TRANSITE JOBS

Again and again this modern water carrier has proved its ability to reduce expenses from the day it goes down

EVERY community that installs J-M Transite Pressure Pipe enjoys this 3-way saving in water transportation . . .

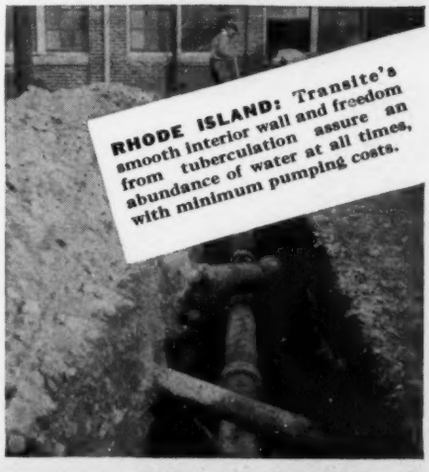
INSTALLATION is economical. The long lengths of Transite Pipe are light; transported to the job at low cost and easily handled by installation crews. Simplex Couplings speed up assembly . . . require no caulking . . . eliminate the need for large bell holes. Trenches can be held to minimum width.

MAINTENANCE is practically zero. Transite Pipe is made of two inherently permanent minerals, asbestos and cement. It has exceptional resistance to the corrosive action of acid soils and ground waters. And because it is non-metallic, it is immune to electrolysis.

PUMPING COSTS are low at the start, because J-M Transite Pipe has an unusually smooth interior surface. And it *stays* smooth. Transite, being non-metallic, *can never tuberculate*. This does away with one of the major causes of increased pumping pressures and reduced carrying capacities.

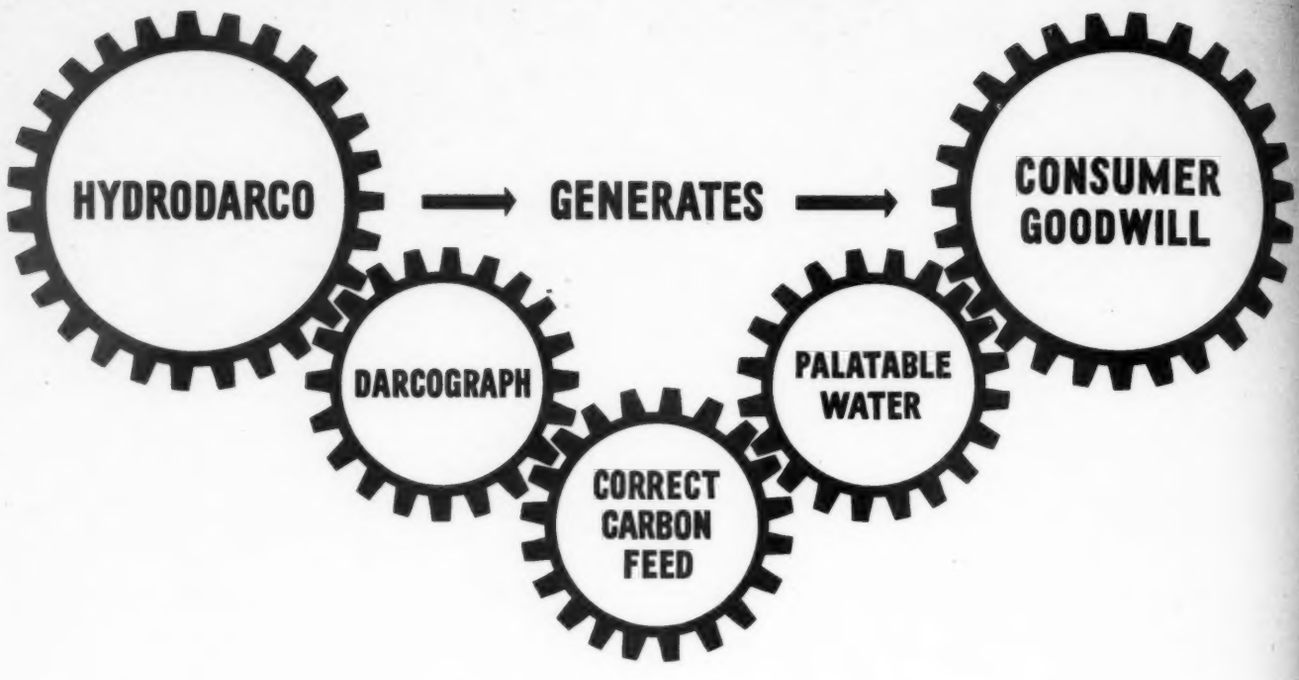
These definite advantages of Transite Pipe merit your careful consideration. The more you know about Transite Pipe, the more clearly you will see why it assures efficient, permanently economical water-carrying systems. For the new Transite Pressure Pipe Brochure, write Johns-Manville, 22 E. 40th St., New York City.

NEVADA: Unusual resistance to corrosive soils is one of Transite's outstanding features, an advantage of particular importance in arid regions.


RHODE ISLAND: Transite's smooth interior wall and freedom from tuberculation assure an abundance of water at all times, with minimum pumping costs.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville TRANSITE PRESSURE PIPE AN ASBESTOS PRODUCT



Consumer good-will depends upon performance. Good water works performance means furnishing pure and palatable water at low cost.

Good carbon performance depends on power to remove taste and odors. Think of it as cats with good appetites, as in the fable,* or gears with driving power.

Carbon performance can be measured, and you can measure it, directly on the water you must treat. The DARCOGRAPH provides a simple, impartial means of applying the basic law of carbon behavior.

HYDRODARCO MEETS THE PERFORMANCE TEST

*See Darco News, March 1938

DARCO

DARCO CORPORATION

60 East 42nd Street, New York, N. Y.

Distributing Points

•

NEW YORK - - BUFFALO
CINCINNATI - - CHICAGO
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• MARSHALL, TEXAS •
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Don't pay Heavy Valve Premium on 100-pound Systems

INSTALL CRANE LIGHT STANDARD IRON BODY VALVES

Crane No. 777 Light Standard Iron Body Double Disc Gate Valve with hub ends and non-rising stem. Brass trimmed.

IT'S WHAT'S INSIDE THAT COUNTS!

● If your operating pressure on the water mains does not exceed 100 pounds, it will pay you to look into the Crane No. 777 Light Standard Iron Body Double Disc Waterworks Gate Valves.

Here is a medium-weight valve that has all the needed features of the heavier patterns designed for municipal systems—that gives you the efficiency and durability of a heavier valve, but saves the premium required on heavy valves with pressure ratings in excess of the needs of your system.

It's Crane inside quality in the No. 777's—as in all Crane Valves—that is your assurance of dependable and lasting performance. It's the soundness of Crane engineering through and through, Crane's skill in metallurgy, and a manufacturing experience of more than 80 years that account for better valve behavior wherever Crane valves are installed.

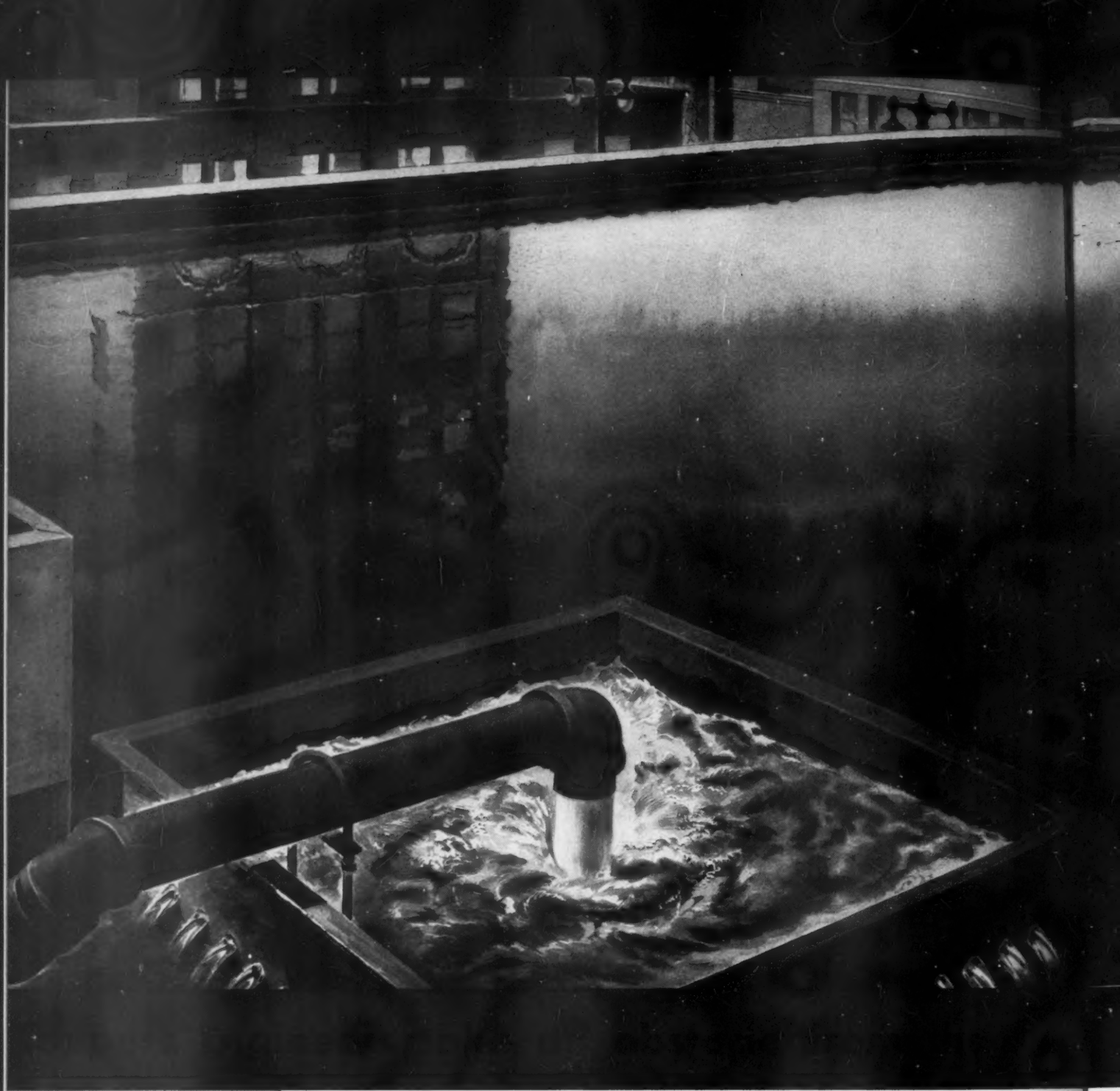
Start an economy program on your valve needs today. Turn to page 107 of your Crane No. 52 Catalog for complete details on Crane No. 777 Light Standard Iron Body Gate Valves. The line is complete—it fills every need of water works, filtration plants, and sewage disposal systems operating at pressures up to 100 pounds.

CRANE

VALVES • FITTINGS • PIPE • PLUMBING • HEATING • PUMPS

CRANE CO., GENERAL OFFICES: 836 S. MICHIGAN AVE., CHICAGO, ILL.

NATION-WIDE SERVICE THROUGH 134 BRANCHES AND MORE THAN 500 WHOLESALERS



KOPPERS DIVISIONS, SUBSIDIARIES AND AFFILIATES

American Hammered Piston Ring Division · Bartlett Hayward Division · Boston Tow Boat Company · Eastern Gas and Fuel Associates · Engineering and Construction Division · Gas and Coke Division · The Koppers Coal Company · Koppers-Rheolaveur Company · The Maryland Drydock Company · Mystic Iron Works · Mystic Steamship Company · National Lumber & Creosoting Company · New England Coal & Coke Company · Tar and Chemical Division · Western Gas Division · The White Tar Company of New Jersey, Inc. · The Wood Preserving Corporation

path of a booming young industry

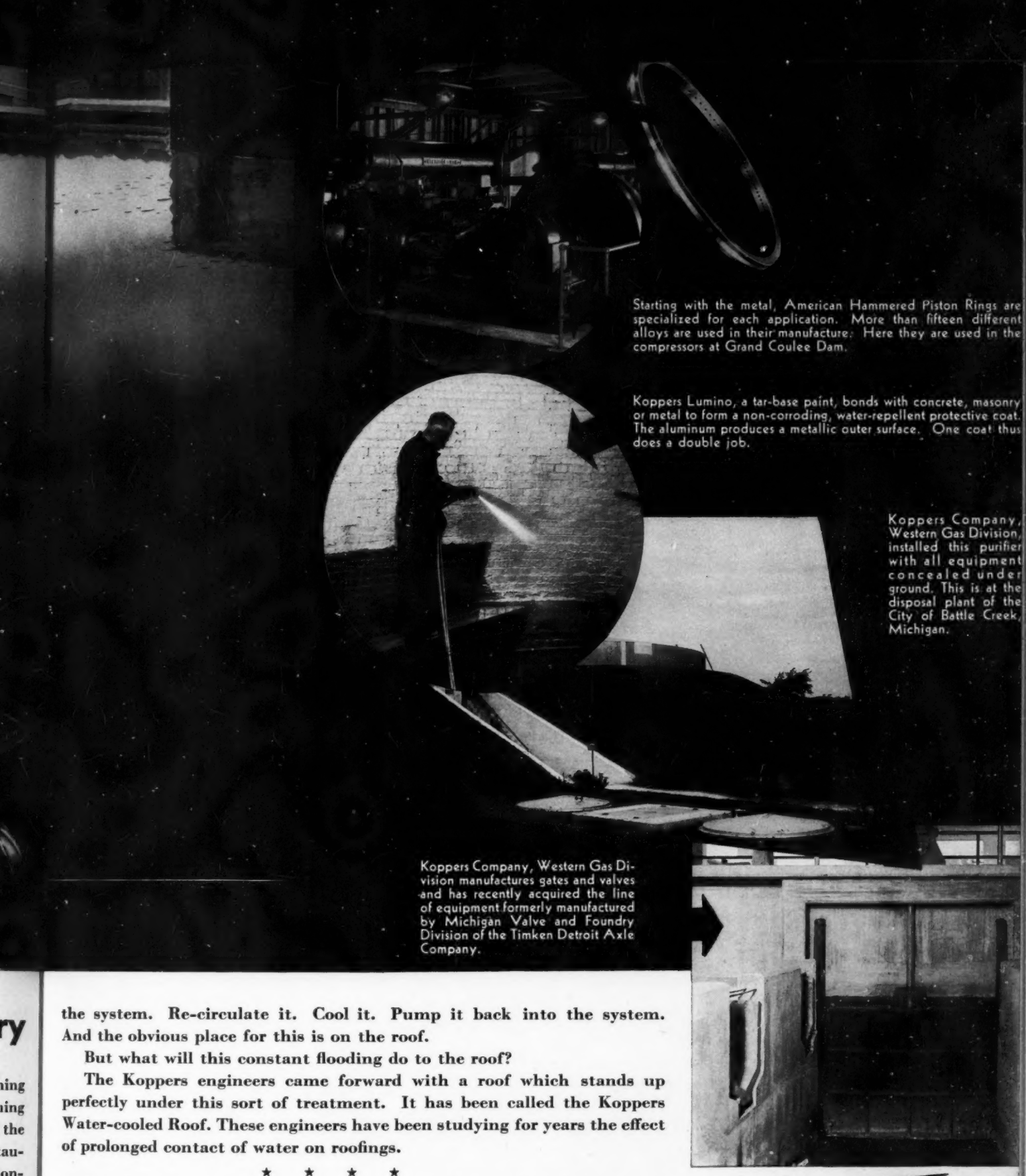
Vast commercial hopes have been pinned on the success of the air-conditioning industry. There were even hopeful people who predicted that the air-conditioning boom would lift the country out of the last depression. It has already boosted the sales of motors and electrical current, of machinery and gas. For stores, restaurants and other commercial establishments which have installed it, air-conditioning has helped to sell more food and more of all the multitude of things a department store sells.

Then, suddenly, the whole rosy picture was changed by the discovery that the water used for air-conditioning was draining the city water supplies and filling the city sewerage systems to overflowing.

Hasty laws clamped down restrictions upon the air-conditioning systems.

A government report indicated that there were already communities where it was practically impossible to sell air conditioning because of these restrictions.

If the owner of an air-conditioning system cannot get water to operate it and cannot dump the water from it . . . the obvious solution is to re-use the water in



Starting with the metal, American Hammered Piston Rings are specialized for each application. More than fifteen different alloys are used in their manufacture. Here they are used in the compressors at Grand Coulee Dam.

Koppers Lumino, a tar-base paint, bonds with concrete, masonry or metal to form a non-corroding, water-repellent protective coat. The aluminum produces a metallic outer surface. One coat thus does a double job.

Koppers Company, Western Gas Division, installed this purifier with all equipment concealed underground. This is at the disposal plant of the City of Battle Creek, Michigan.

Koppers Company, Western Gas Division manufactures gates and valves and has recently acquired the line of equipment formerly manufactured by Michigan Valve and Foundry Division of the Timken Detroit Axle Company.

the system. Re-circulate it. Cool it. Pump it back into the system. And the obvious place for this is on the roof.

But what will this constant flooding do to the roof?

The Koppers engineers came forward with a roof which stands up perfectly under this sort of treatment. It has been called the Koppers Water-cooled Roof. These engineers have been studying for years the effect of prolonged contact of water on roofings.

★ ★ ★ ★

This is only one of scores of puzzling problems which Koppers engineers have been able to meet. There may be some problem in your business they could help to solve. We would welcome an opportunity of discussing it with you.

KOPPERS COMPANY · PITTSBURGH

SEE IF KOPPERS MAKES IT

KOPPERS

A COMMUNITY ISOLATED BY *FLOOD WATERS* ...BUT ITS WATER SUPPLY IS SAFE

IN TIME of emergency, some communities have found themselves temporarily unable to obtain normal water purification supplies. But with wise foresight, many have provided themselves with a secondary line of defense—a supply of Perchloron for use at just such times.

Perchloron has an available chlorine content of more than 70%. It is concentrated, stable, perfectly uniform. Dissolves readily in water. Packed 12 handy-sized cans to the case—no return containers to bother you.

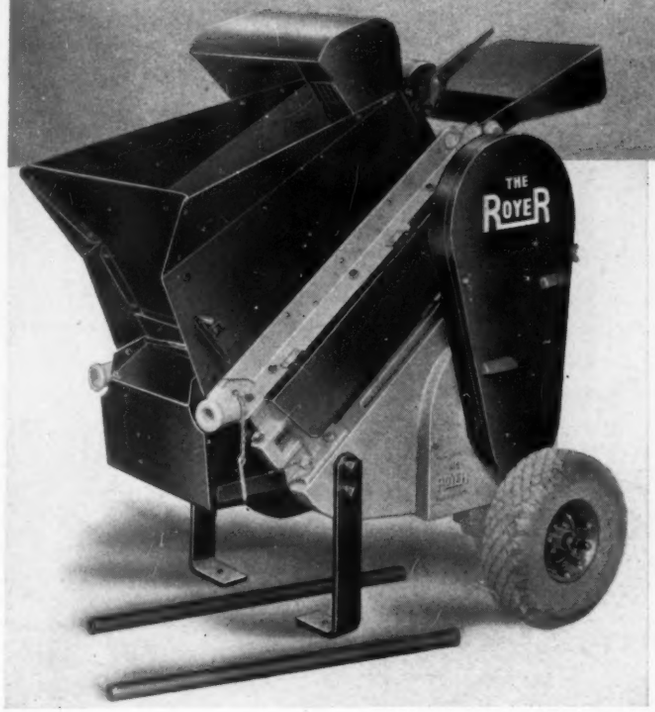
Under normal conditions also, you will find Perchloron an economical convenience. Use it for sterilizing new mains, and for clear wells and filters. It has been widely adopted for swimming pool sanitation, and has earned a place in sewage treatment. Why not write for new, free booklet today?

PENNSYLVANIA SALT MANUFACTURING COMPANY · Est. 1850
Widener Bldg., Philadelphia, Pa.
New York · Chicago · St. Louis · Pittsburgh · Tacoma · Wyandotte

FREE—NEW BOOKLET
Covers the many uses of Perchloron. Gives full data on emergency feeding, determination of residual chlorine, preparing Perchloron solutions, and many other interesting points.

Perchloron

PENNSYLVANIA SALT *Chemicals*



Model C-2 illustrated above—Machines made in four sizes—either belt, gasoline engine, or electric drive. Pneumatic tires standard on all models.

The ROYER DISINTEGRATOR

is a real thrifty machine in every sense of the word. Many cities and towns have learned from actual experience that the Royer Disintegrator will produce enough compost suitable for Municipal Parks, playgrounds, lawns and gardens, the sale of which will soon pay for the cost of the machine.

The Royer Sludge Disintegrator will rapidly and economically shred sludge containing from 30 to 60% moisture into fine particles at a cost of 30 cents or less per cubic yard.

Operating and maintenance costs very low.

Let us send you details of the machine and interesting information on the value of disintegrated sludge as a fertilizing compost.

A ROYER PAYS FOR ITSELF

ROYER FOUNDRY & MACHINE CO.

158 Pringle St. — Kingston, Pa.

C. G. WIGLEY, Sole Rep.
3108 Atlantic Ave., Atlantic City, N. J.

HEAVY LOADS won't break an ARMCO SEWER

The satisfactory performance of an older Armco line led to the selection of Asbestos Bonded Armco pipe for this recent installation at Rochester, Minnesota.

● No matter what else may happen to an Armco sewer, heavy loads will not break it. Tree roots will not reduce its efficiency. And soft foundations will not separate the individual sections.

These common ailments, which account for the majority of all sewer failures, are *definitely overcome* in the design of Asbestos Bonded Armco sewer pipe. Its strength and flexibility are proved by 41 years of successful experience.

To these superior *structural* qualities, Armco has added a high degree of *material* permanence. First: by using a galvanized, rust-resisting iron with a 30-year service record. Second: by reinforcing the pipe in the bottom where the wear is hardest. And third: by "bonding" a special bituminous coating to the finished pipe. Address: Armco Culvert Mfrs. Assn., Middletown, Ohio.

ARMCO

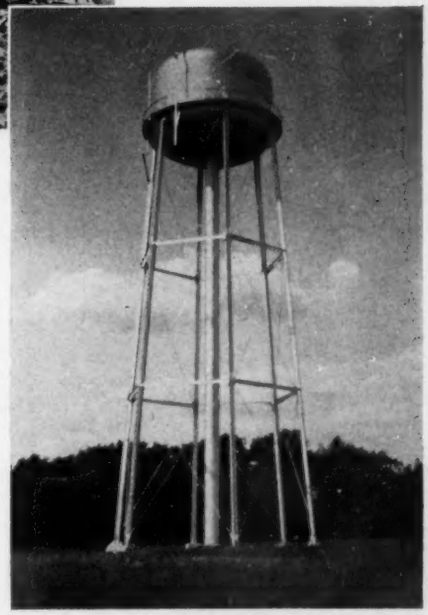
ASBESTOS BONDED ARMCO SEWER PIPE

A PRODUCT ORIGINATED AND DEVELOPED BY ARMCO ENGINEERS

MODERN Water Storage In the East

The view directly above shows a 500,000-gal. Horton radial-cone bottom elevated storage tank located in Rockland, Mass. It improves distribution pressures in the water system and provides increased fire protection for the entire city. Pictured at the right is one of two new 500,000-gal. water tanks recently erected at West Point, N. Y. These tanks are located on the sides of hills and provide water for general service.

The illustration below shows a typical Horton ellipsoidal - bottom elevated water tank located at Grand Island, N. Y. This tank has a capacity of 150,000-gals., and is 100 ft. to bottom. It has been installed to provide gravity pressure in the distribution system serving a new residential development. The ellipsoidal roof gives the tank a stream-lined appearance.



THE efficient manner in which modern water storage can be used to help solve water supply problems has been demonstrated in many sections throughout the East. Three typical examples are shown on this page. Lower pumping costs, more uniform pressures, improved fire protection—these are but a few of the important advantages available to cities in every locality that employ the services of modern water storage tanks. Our nearest office will be glad to supply you with complete information or estimating figures.

CHICAGO BRIDGE & IRON COMPANY

Chicago	2198 Old Colony Bldg.	Birmingham	1586 North 50th Street	Philadelphia	1644-1700 Walnut St. Bldg.
New York	3390-165 Broadway Bldg.	Tulsa	1646 Hunt Bldg.	Boston	1548 Consolidated Gas Bldg.
Cleveland	2262 Rockefeller Bldg.	Houston	2919 Main Street	San Francisco	1083 Rialto Bldg.
Dallas	1479 Liberty Bank Bldg.	Detroit	1551 Lafayette Bldg.	Los Angeles	1455 Wm. Fox Bldg.

Fabricating plants in CHICAGO, BIRMINGHAM, and GREENVILLE, PA.

MATHIESON CHLORINE SERVES LINCOLN SEWAGE PLANT

Says Wardner G. Scott, Engineer, Sanitary District Number One of Lancaster County, Nebraska:

"The quality of Mathieson Liquid Chlorine, together with the prompt service on shipments has been entirely satisfactory at all times."

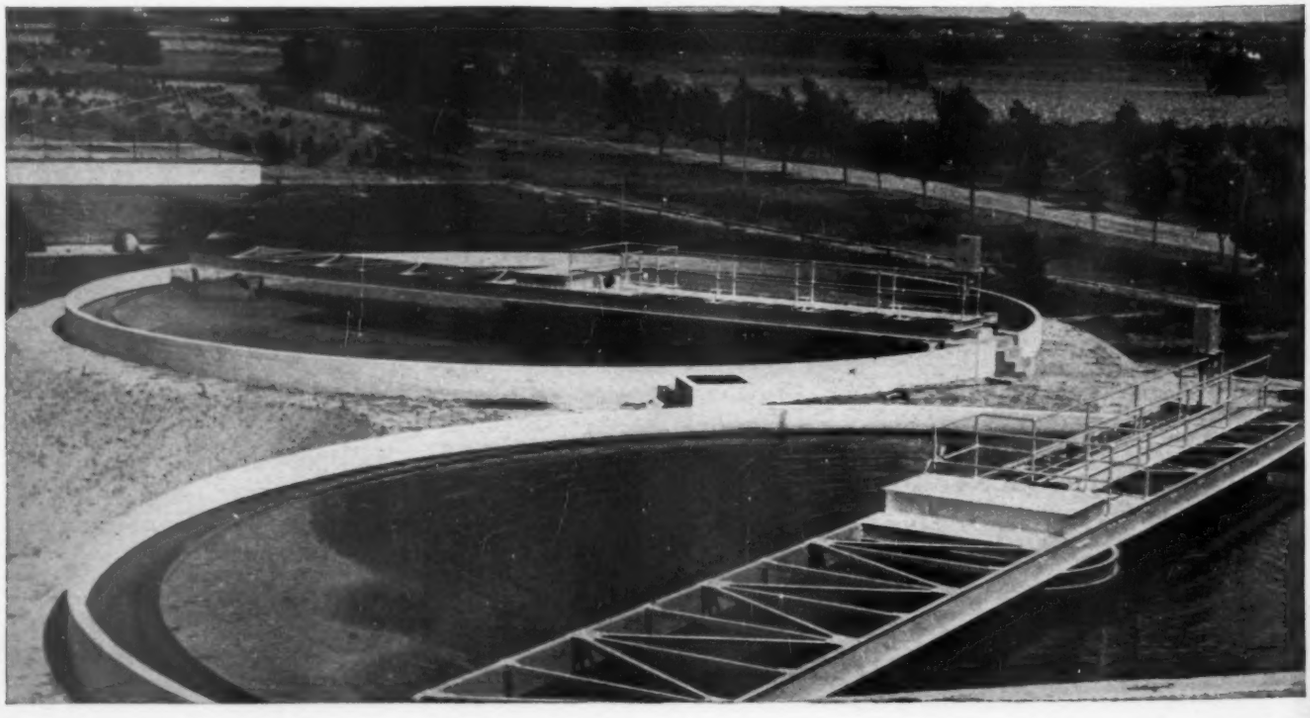
ABOVE all else, whether the job in hand be water purification, sewage treatment or swimming pool sanitation, your supply of liquid chlorine must be dependable. You have a right to expect at all times a pure product, trouble-free containers and valves, prompt delivery service.

At Lincoln, Nebraska, where the sewage treatment plant uses chlorine in ton containers, Mathieson Liquid Chlorine has been proving its dependability over a period of years. As Mr. Scott states, he has found the quality of the product and the prompt service on shipments entirely satisfactory at all times.

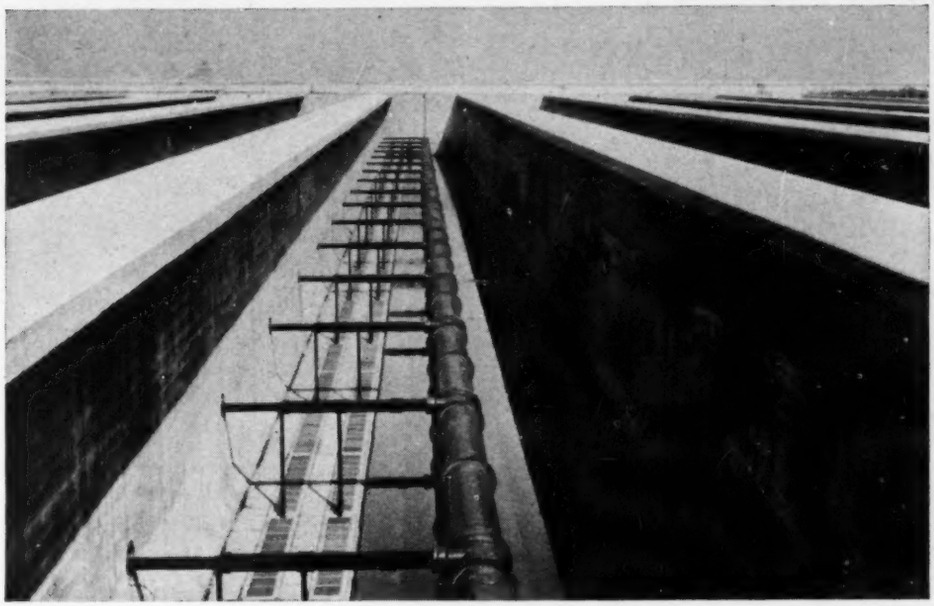
Because so many sanitary officials have had the same experience as Mr. Scott, they have learned to specify Mathieson whenever there is a chlorinating job to be done.

The MATHIESON ALKALI WORKS (Inc.)
60 East 42nd Street **New York, N. Y.**

Soda Ash . . . Liquid Chlorine . . . Bicarbonate of Soda . . . HTH and HTH-15 . . . Caustic Soda Bleaching Powder . . . Ammonia, Anhydrous and Aqua . . . PH-Plus (Fused Alkali) Dry Ice (Carbon Dioxide Ice)



FORCEFUL FACTS ON SEWAGE AERATION BY AIR DIFFUSION—No. 16



POROUS DIFFUSERS HAVE LONG LIFE AND REQUIRE LITTLE ATTENTION

● Fixed diffuser plates or tubes have now been in continuous service in many plants for ten years and more with little or no servicing and cleaning. With proper air filtration and continuous maintenance of blower operation they show no appreciable clogging or dropping off of efficiency with time. Unless intermittent operation is expected no special provision need be made for periodic cleaning of diffusers. This keeps down original construction and installation costs—always an important factor.

Porous diffusers are permanently resistant to corrosion and physical wear and tear. With reasonable care in their operation, maintenance expenses are nil. Aloxite Brand Porous Diffusers are made for enduring utility.

Use porous diffusers—the most efficient equipment for any aeration operation.

POROUS CARBORUNDUM REG. U. S. PAT. OFF. BRAND PRODUCTS

THE CARBORUNDUM COMPANY, NIAGARA FALLS, N. Y.

REG. U. S. PAT. OFF.

Sales Offices and Warehouses in New York, Chicago, Philadelphia, Detroit, Cleveland, Boston, Pittsburgh, Cincinnati, Grand Rapids

(Carborundum and Aloxite are registered trade-marks of The Carborundum Company)

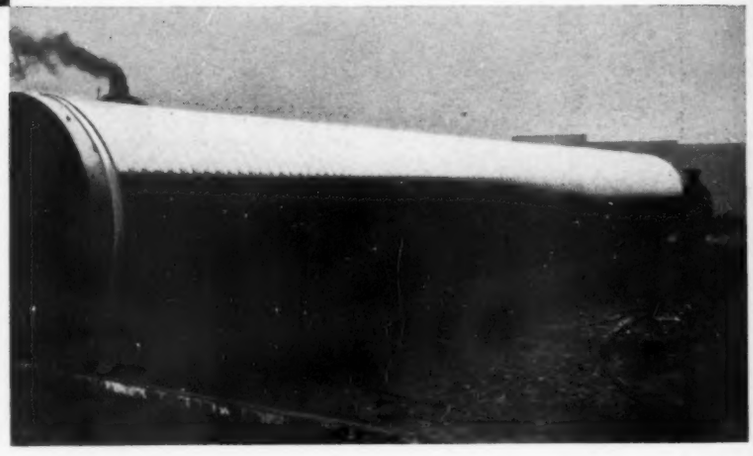
DEPENDABLE PROTECTION

ASSURED BY

Reilly

PIPE ENAMEL AND PRIMER

Shown above: Interior surface of steel water conduit, coated with REILLY PIPE ENAMEL and PRIMER to prevent corrosion and tuberculation and to insure permanent water carrying capacity.



Exterior surface of steel water conduit (shown above) coated with REILLY PIPE ENAMEL and PRIMER.

● On major pipe line projects the constantly increasing use of REILLY PIPE ENAMEL and PRIMER—backed by the record of protection afforded—is testimony of the dependability of Reilly coatings.

Not only in major projects, but also in hundreds of less spectacular, yet just as important waterworks jobs throughout the country REILLY PIPE ENAMEL and PRIMER are proving their worth.

REILLY PIPE ENAMEL and PRIMER are easily applied. They withstand wide variation in temperature, do not check, crack or peel at low temperatures—do not flow or sag from vertical surfaces at high temperatures. Here is permanent protection of investments, and assurance of low maintenance costs. Address the nearest Reilly office named below.

Reilly COAL TAR PRODUCTS

REILLY TAR & CHEMICAL CORPORATION

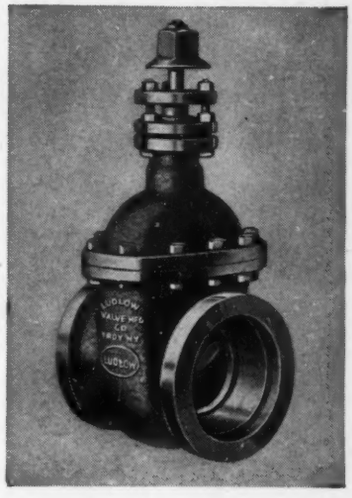
Executive Offices: Merchants Bank Building, Indianapolis, Indiana

2513 S. DAMEN AVENUE, CHICAGO, ILLINOIS 500 FIFTH AVENUE, NEW YORK, N. Y. ST. LOUIS PARK, MINNEAPOLIS, MINN.

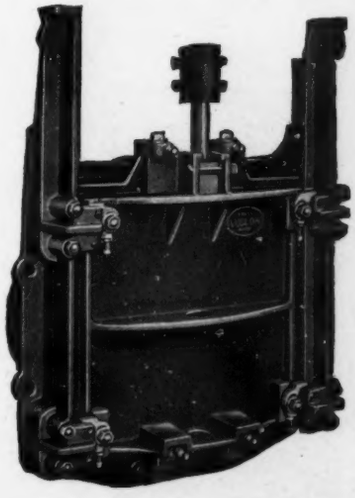
FIFTEEN · PLANTS · TO · SERVE · YOU

For Better CONTROL and CAPACITY *Specify* LUDLOW

When final costs are the first consideration, experienced engineers insist on Ludlow Valves. They *know* these valves will give dependable, year-after-year service under high pressures and punishing conditions without shut-downs for repairs or replacement. These valves have been repeatedly improved and simplified to the point where perfect seating, protection against leakage, and minimum wear are assured. They are available in both standard and special purpose types.



Ludlow Hydrants and Sluice Gates also get first call wherever longer, trouble-free service and reduced maintenance costs are demanded.



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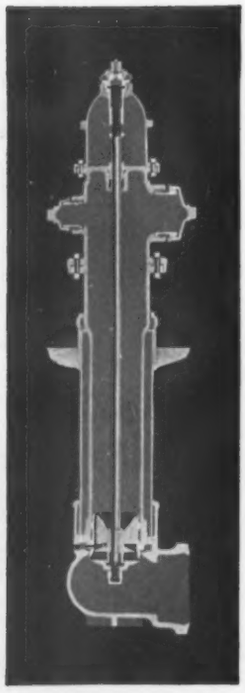

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WATER WORKS & SEWERAGE

E. S. GILLETTE, Publisher — L. H. ENSLOW, Editor

ARTICLES AND AUTHORS Scheduled for Future Issues

"A New and Effective Method of Aquatic Weed Control," by **Herman Seydel,** President of The Cloroben Corporation, Jersey City, N. J., involves under-water atomization of a heavy, insoluble, chlorinated liquid hydrocarbon. Apparently the material seeps through the mud to reach the root structure of aquatic weed growth and, thereby, permanently destroys such growth. The weed problem in many lakes and ponds is a real one, and is incompletely solved. If the method described can be shown to be as effective elsewhere as in the cases reported by Mr. Seydel it will prove a great boon in maintaining clean marginal areas of reservoirs, where algae and insect larvae are most difficult to control and tastes and odors originate. The scheme reported is well worth consideration on an experimental basis, by those interested, to further test its efficacy under conditions at hand.

"Exchanging Ideas" is merely a way of captioning the "Kink" article by **Roland J. Leveque,** Supt. of Filtration, at Fredericksburg, Va. Besides much underlying philosophy of a live-wire operator, presenting interesting experiences, the author contributes several of those always interesting and helpful operating and maintenance "Kinks." After a manner of suggesting that others may find something in the motto "Give, that ye may receive," Mr. Leveque captions his contribution "Exchanging Ideas." To our readers, we wish to say that we will be happy to assist in seeing that Mr. Leveque, and others, benefit by reading in a future issue of this magazine their reciprocating "Exchange of Ideas" and "Operating Kinks."

"Filter Intestines" is the unusual caption of a paper by **H. G. Turner,** Research Engineer of the Anthracite Institute, Inc., State College, Pa., which contains considerable food for thought. Assuming no interest in modern rapid sand filter design, operation and maintenance, beyond that of wishing to get the low-down on the "Why" of the present day filter, Mr. Turner puts forward some very pertinent questions for the water works engineer and chemist to answer—or, at least, to think over. His analysis of the "expected" of a rapid sand filter and its seeming shortcomings, as they appear to the inquisitive novice in "filter lore," have some points which can not be ignored if the truth must be out. In essence, believing that present day filters and their shortcomings are being protected by a "Grand-father Clause," Mr. Turner suggests that it is time to do something about the matter of filtration specifications and standards now clearly outmoded by factual proof which the thinking observer can not ignore.

"Water Works Improvements at Pittsburg, Kansas," are being described in a paper by **W. J. Lapworth,** Plant Superintendent, and **T. D. Samuel III,** who served as Resident Engineer during the difficult construction, involving a new pumping station and water softening plant, into which much of the old equipment had to be transferred—and, without interruption to water service. Interesting are the methods and pictures of skid-rolling the old boilers and massive steam pumps to the new location, piece by piece.

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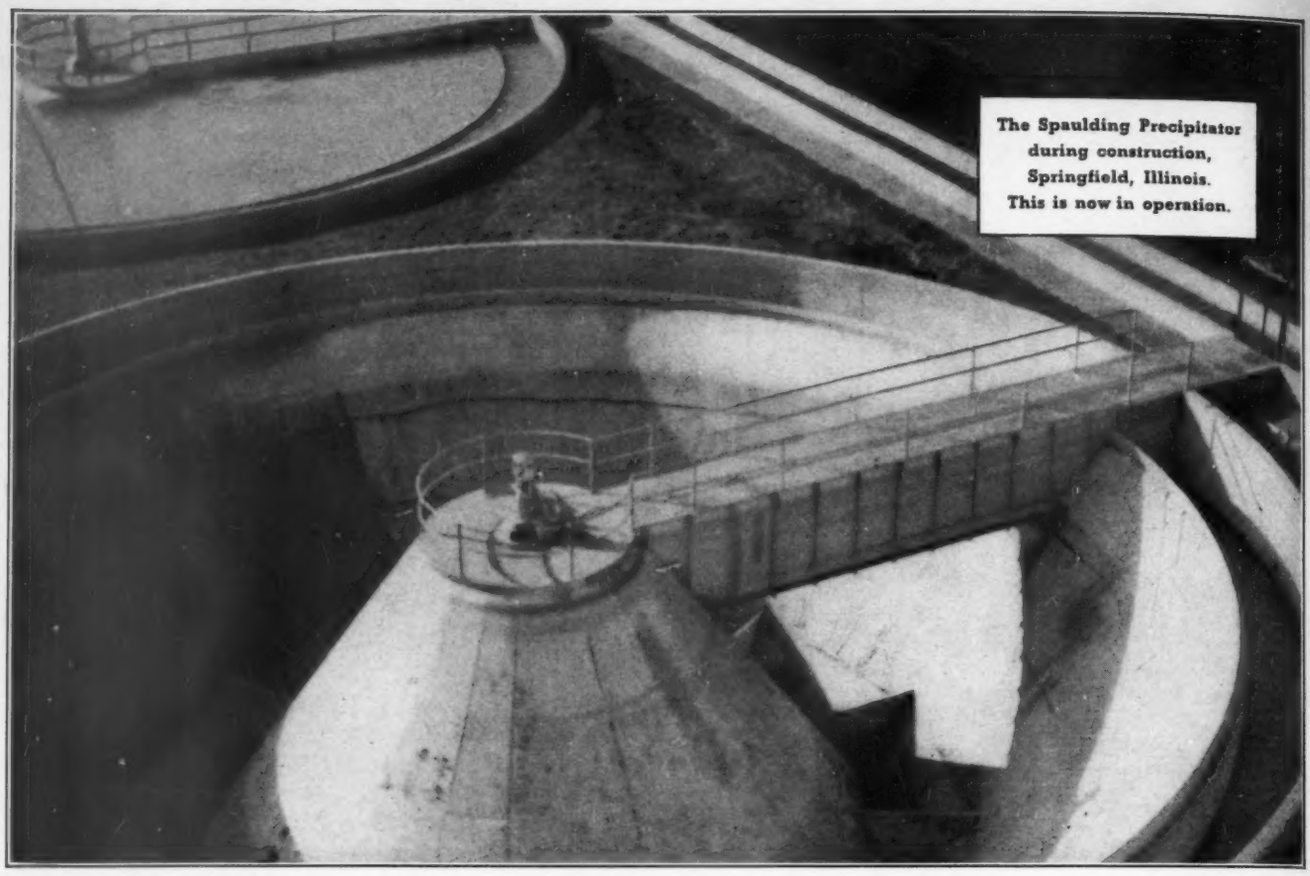

The Spaulding Precipitator during construction, Springfield, Illinois. This is now in operation.

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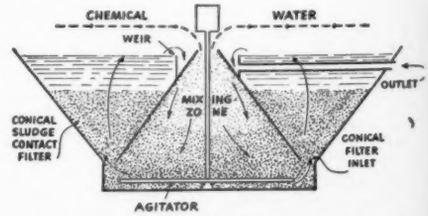

Typical arrangement of Spaulding Precipitator

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WATER WORKS AND SEWERAGE
A GILLETTE PUBLICATION
VOL. 85 JUNE, 1938 No. 6

THE CLAYTON SEWAGE TREATMENT PLANT OF ATLANTA

By M. T. SINGLETON*

Consulting Engineer, Atlanta, Ga.

The Author

THE R. M. Clayton sewage treatment plant is the largest of the four disposal plants recently completed by the City of Atlanta. These disposal plants are a part of a program of sewerage construction and sewage treatment undertaken to remedy conditions caused by gross pollution of many small streams in the suburban areas of Atlanta.

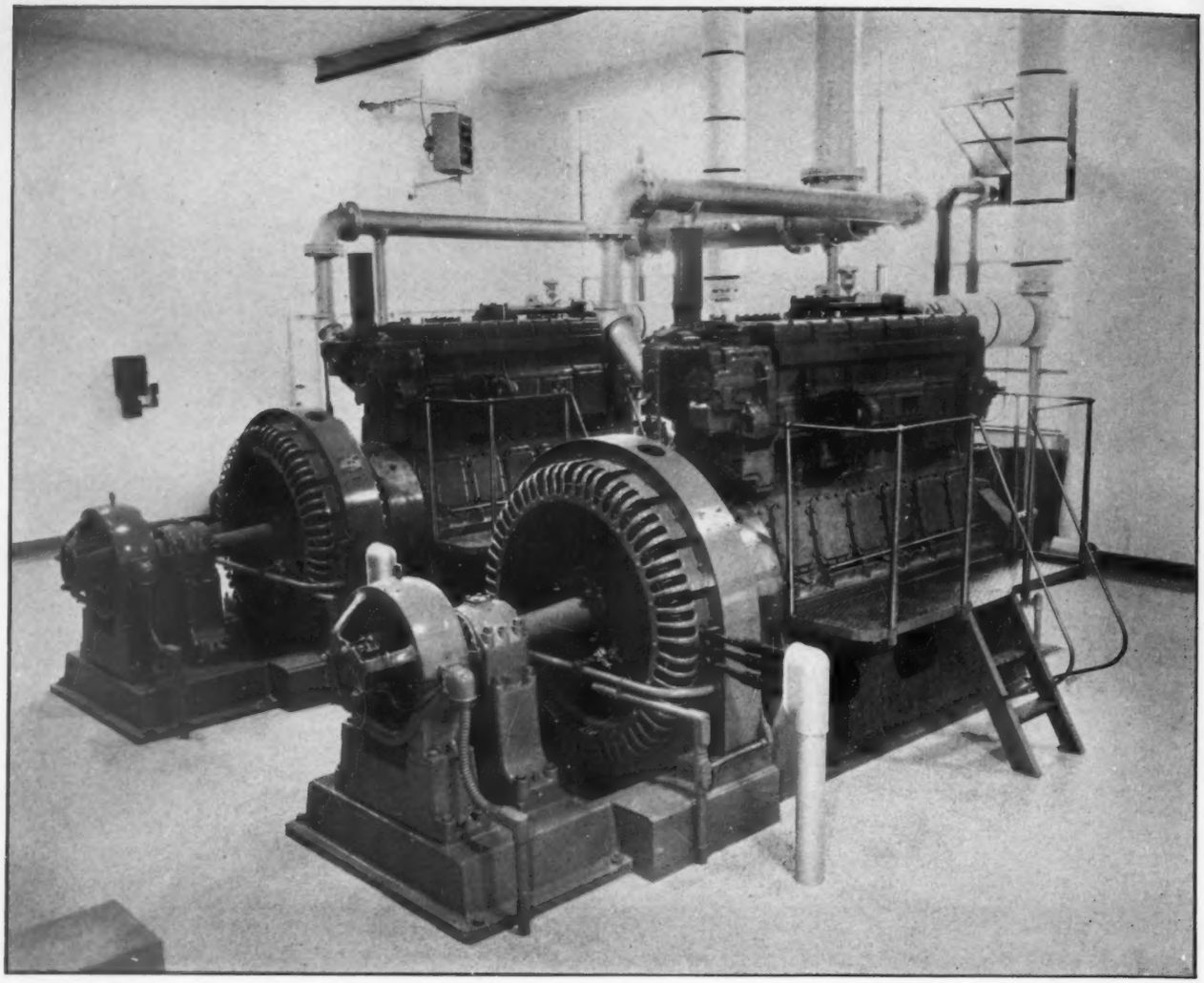
The natural drainage from the City of Atlanta is divided into three major drainage areas. The West and North sides of the City drain to the Chattahoochee River basin; the East and South sides to Intrenchment Creek and South River, and certain suburban areas on the South side drain to the Flint River basin. Thereby, four separated sewerage systems and as many treatment works have to be maintained.

The Clayton plant serves the West and North sides of the city, together with the City of Decatur to the Northeast and certain heavily built up unincorporated areas in both Fulton and DeKalb counties.

The area served by this plant is traversed by two creeks, Peachtree Creek and Proctor Creek. Peachtree Creek, extending generally along the entire northern city limits of Atlanta and Decatur, runs for a distance of some 13 miles through a high-class residential section, and discharges into the Chattahoochee River about four

*Wiedeman and Singleton, Engineers, Atlanta, Ga.

Central Building, the Clayton Plant. Laboratory and Offices, Left Front; Gas Engine-Generator Room, Right Front; Chemical Feeders and Chlorinators, and Gas Boilers, in Rear; Sludge Filters and Air Blowers on Rear Ground Floor; Chemical Handling Equipment, Storage Bins and Battery of Central Ventilating Fans on Third Floor Exhausting Through the Tower.



Twin 180 H.P. Cooper-Bessemer Gas Engines and Generators. Will Produce More Power Than Is Required to Operate the Clayton Plant. Space Has, However, Been Provided for a Third Unit When Needed.

miles west of the city limits. The old Peachtree Creek sewage disposal plant (incidentally, one of America's historic installations) was located on this stream, about four miles from the river. This plant was of the Imhoff tank-trickling filter type, had long been badly overloaded, and its location was detrimental to the natural development of the area. With the growth of the city to the North, unincorporated areas north of the creek were developed. The result was, that numerous small sewers were constructed at various points in the area, and discharged into small streams tributary to Peachtree Creek, or to small septic tanks located on such streams. Numerous outfall sewers serving Decatur and Atlanta, which could not be conducted to the old Peachtree Plant, discharged into the creek without treatment.

The New Program

The new program involved construction of an interceptor sewer, starting at Decatur and following along Peachtree Creek about 13 miles to a disposal plant site located on the east bank of the river just below the mouth of the creek. From this sewer, laterals were extended to pick up the numerous sewers which formerly discharged into the creek itself and also to intercept the flow formerly treated at the old Peachtree Creek plant.

Conditions on Proctor Creek, which drains from the northwest section of the city, were similar. That is, there exists on this creek an old sewage disposal plant known as the Proctor Plant, which was badly overloaded. Since the unincorporated areas around this plant and beyond it had built up, several sewers discharged into the creek without treatment.

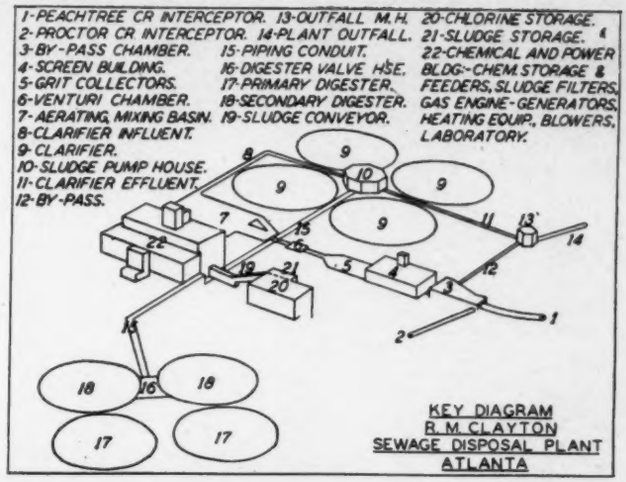
The immediate need, therefore, which brought about the construction of sewage disposal facilities on the north and west sides, was to remove the gross pollution from the two creeks above mentioned, and from their small tributaries leading from various sub-divisions. These small streams were virtually open sewers and a source of great nuisance.

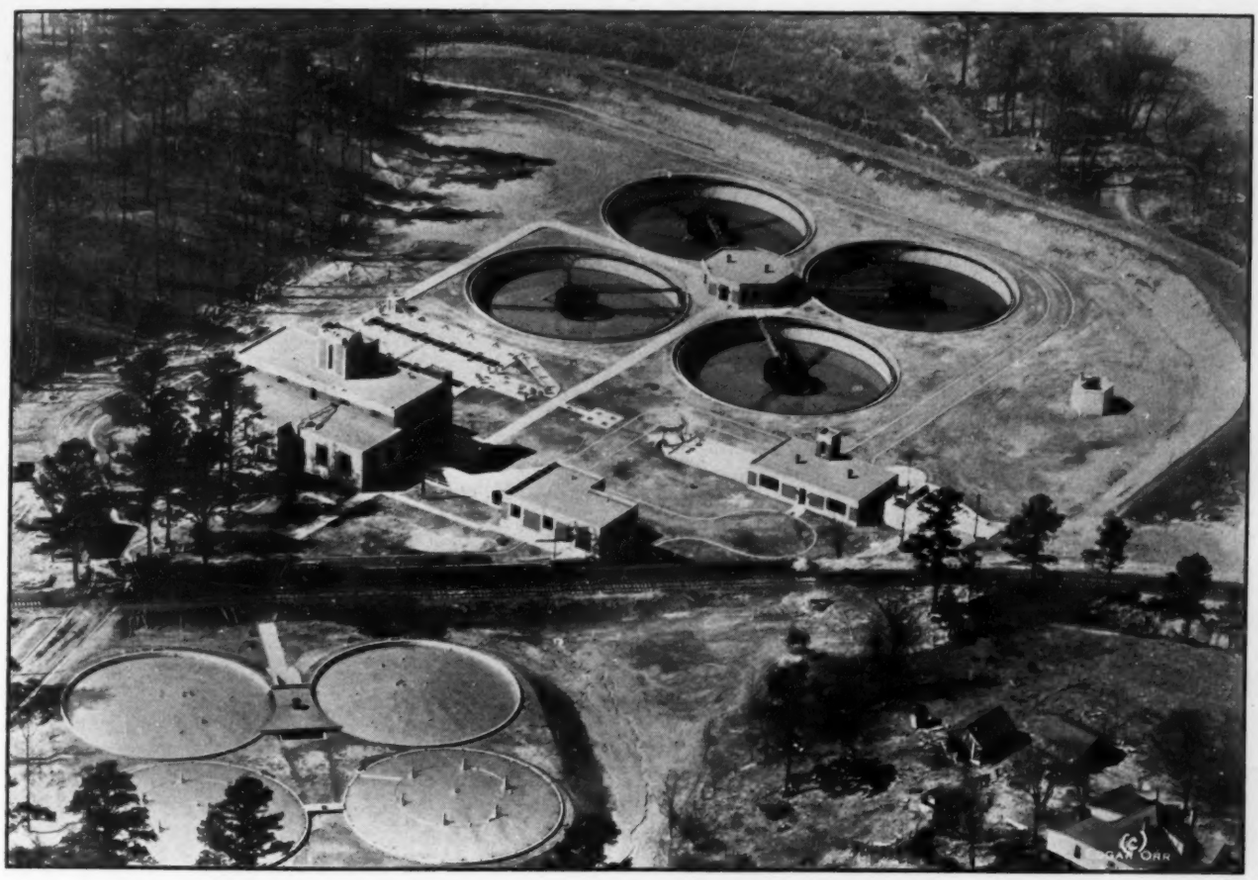
The effect of the discharge of Atlanta's sewage into the clay-laden Chattahoochee River had never been particularly noticeable except during times of extreme drought. That is, there has seldom, if ever, been any depletion of oxygen to such an extent as to endanger fish life or cause the river to become septic. The worst conditions in the river had been reported to be during times when the river flow was extremely low and local showers in Atlanta caused a flushing out of sludge deposits in the tributary streams and storm sewers, with contributing dilution to a compensating degree. During such times, ribbons of excessive pollution have passed down the river, accompanied by considerable visible floating sludge.

Although the population of the Greater Atlanta District is about 375,000, the contributing population to the Chattahoochee River drainage area is now only approximately 230,000.

River Studies

Studies made of the river by the Georgia State Department of Health and the City of Atlanta, under summer or normal dry weather conditions, indicated that when the river flow was about 1000 sec. feet, the dissolved oxygen content in the stream was at no point lower than approximately 70 per cent of saturation. The maximum 5-day B.O.D. of the river water occurred at a point about 9 miles down stream and was approximately 4 parts per million. These tests further indicated that at a point about 30 miles down stream the 5-day B.O.D. of the water was not more than 1 part per million and the dissolved oxygen content of the stream at this point was approximately 80 per cent of saturation, showing the remarkable power of the stream to assimilate sewage by





General View of the Clayton Plant of Atlanta Nearing Completion. See Accompanying Key Diagram.

natural processes without causing nuisance.

It might be noted that the total bacterial count of the stream at the time tests were made was a maximum at approximately 280,000 per cc at a point about 15 miles down stream and this count was reduced to normal about 30 miles down stream.

At the present time no municipality takes its water supply from the Chattahoochee River within a stretch of approximately 100 miles below Atlanta. There is no pollution of consequence above Atlanta and the dissolved oxygen content is normally close to saturation. The stream is usually high in turbidity and colored red from the erosion of the Georgia's clay soils. It is a swift flowing stream with many shoals which aid in its reaeration along its course.

Selection of Treatment

In the design of the Clayton plant, it has been estimated that on the basis of the present contributing population on this watershed (230,000), sedimentation alone will be sufficient when the flow of the river exceeds 720 sec. ft., and that when the stream flow is less than this, additional treatment probably will be required.

This estimate is based on the premise that the dissolved oxygen in the river will be about 37.7 lbs. per day per sec. ft. of flow under summer conditions and that the B.O.D. of the sewage will be about 0.127 lbs. per capita after clarification. It has been assumed that if the total 5-day oxygen demand of the sewage polluted water does not exceed at any time the dissolved oxygen content of the stream, the natural processes of reaeration and added

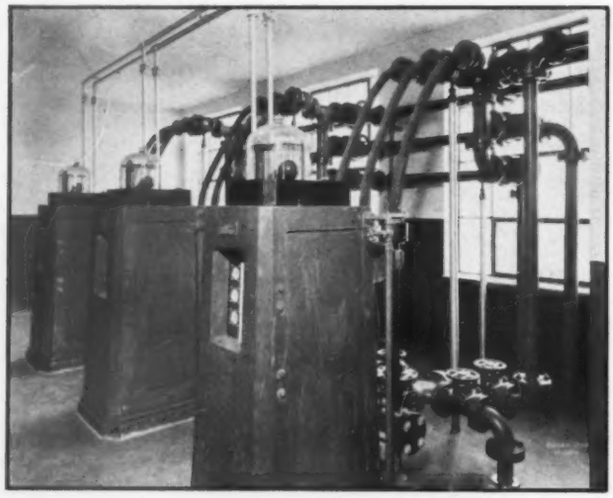
Battery of International Chemical Feeders. Chlorinators Beyond Partition on Left; in Foreground, Copperas Dissolving and Chlorinating Vats with Recirculation Pumps Delivering Copperas Solution to the Chlorinator Injectors Instead of Water; in Rear, Lime Feeder and Slaker.

dilution of the stream, along its course, will prevent excessive depletion of oxygen.

Under 1950 conditions, with the estimated contributing population of 300,000, the critical flow has been assumed at 930 sec. ft.; under 1970 conditions, with an estimated population of 400,000, the critical flow has been assumed at 1240 sec. ft.

A study of the stream flow records over a period of 20 years indicates that a flow of 720 sec. ft. can be expected at least 96 per cent of the time; and a flow of 930 sec. ft. (1950 conditions) at least 90 per cent of the time. The flow in the river rarely falls below 600 sec. ft. in ordinary years, although under extreme drought conditions, as in 1925, the minimum flow was 225 sec. ft. for a short period, which was the lowest flow on record.

Under the above premises, and anticipated conditions, the Clayton plant has been designed to provide for sedimentation only for the major portion of the time, facilities being included for chlorination, and likewise for chemical precipitation during such intervals, as this additional treatment may be desired.



Battery of W&T Master Chlorinators—Operated with Copperas Solution or Water at Will; Combined Capacity 6,000 Lbs. Chlorine Per Day.

Plant Design

The plant is designed for 42 million gallons daily dry weather flow. It consists of mechanically cleaned bar screens and grit chambers followed by chemical mixing basins, using diffused air. These basins can be used as preaeration basins when chemicals are not used. Clarifiers are equipped for mechanical removal of sludge and sludge is to be digested and then de-watered on vacuum filters. Elutriation of sludge was provided in the plans, but eliminated, at least temporarily, when contracts were awarded. Sludge gas is utilized in internal combustion engines for generating power for use in the plant. Chemicals are handled pneumatically from cars to storage and from storage to chemical feed machine hoppers.

The construction of this plant permits the abandonment of both the old Proctor Creek plant and the Peachtree Creek plant.

The construction of the intercepting sewers in the Peachtree Creek valley and the Proctor Creek valley, together with the branch sewers which follow along the tributaries of these creeks is not yet quite complete. It is anticipated that this work will be complete in June of this year and that the plant will go into operation at that time.

Details of Plant

Screens and Comminutors

Since the sewers leading to the plant are combined sanitary and storm sewers, immediately beyond the junction of the sewers has been provided a storm overflow chamber, equipped with adjustable weirs. It is planned to carry a maximum flow of 90 million gallons daily to the plant, the remainder being diverted to the river during storms.

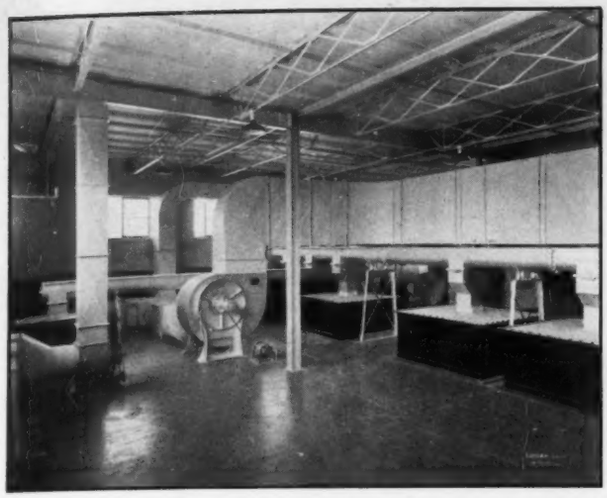
Following the overflow weirs is the screen building, which houses the bar screens, comminutors and a portion of the grit collector units. There are two bar screens installed, the screens being of the mechanically cleaned type and having openings of one inch between bars. Immediately ahead of the bar screens, air diffuser plates are provided in the channel for preventing undue sedimentation of solids. The bar screens are controlled on a time cycle by means of electrical time clocks and also by float control which takes precedence over the timing device. Screenings are discharged into a flume above the floor level and flushed to two comminutors located out of the line of flow to one side of the bar screens, the flushing water for this purpose being provided by a small pump which takes its suction from the sewage channel. The comminutors are specially designed in that the number of teeth provided is greater than ordinarily used on comminutors of the size installed.

After the screenings are passed through the comminutors they return to the sewage channel, either ahead of or after the bar screens.

This type of installation was adopted to conserve head loss in the plant and to reduce the quantity of screenings and volume of flow passing through the comminutors, it being felt that the bar spacing on the mechanical screens was sufficiently small to prevent undue trouble in the plant. The quantity of screenings removed by this size opening (1 in. between bars) and subsequently delivered to the comminutors will be approximately 10 per cent of the amount of screenings ground by the comminutor if the entire flow was passed through these units with their much smaller bar openings. It is readily apparent that much smaller units could be employed.

Grit Collectors

The grit collectors immediately following the bar screens are two in number and of the drag type, the grit



Chemical Conveyors and Feed Machine Hoppers. Some of the Ventilating Fans, Serving Various Parts of the Plant, Can Also Be Seen in This Third Floor View.

being discharged by a screw conveyor type grit washer to a storage bin at the ground floor level of the screen building. A bucket elevator is provided to elevate the screenings from the receiving hopper or bin and discharge outside the building into trucks. The grit collector is entirely covered with a concrete slab, one end of it being housed in the screen building. Within the building is the drive equipment, the washer, storage bin and elevator. Forced draft ventilation of the screen building, and the covered grit collector, is provided by an exhaust fan and duct system which exhausts the air up through the ventilating shaft located in the roof of the main control building.

Venturi Meters

After leaving the grit chamber, the sewage flows through a Venturi meter tube, the tube itself being constructed of concrete. The recording devices are located within the main administration building, using electrical transmission. Automatic proportional feed devices are installed in the Venturi pit for control of the chlorinators and chemical feed equipment located in the main building.

Aeration or Mixing Basin

The aeration and mixing basins, designed for 15 minutes' detention at 42 M.G.D. rate, operate on diffused air. The two basins are of spiral flow design and air is supplied by two 2000 C.F.M. blowers located in the main building. The sewage first enters a flash mixing compartment where chemicals can be applied, after which it flows through either one or both of two mixing chambers. The mixing chambers are covered with a concrete slab and the air is exhausted through a duct and fan system into the ventilating stack built into the main control building.

It is planned to use the pre-aeration chamber as a means of odor control and grease removal, whether or not chemicals are used. A bypass is provided in case it is not desired to use these basins at any time.

Sedimentation Basin

After leaving the aero-mixing chamber, the sewage flows to a distributing well located in the center of the cluster of settling units, from which it is distributed to the four 112 ft. diameter circular center-fed clarifiers, designed for 2 hours' detention at 42 million gallons' rate. These units are equipped with mechanical sludge scrapers and skimming devices. The distributing well is enclosed in a building which also houses the sludge pumps, four in number, which remove the sludge and skimmings from the clarifiers and pump it to the digesters. From the clarifiers the sewage discharges into the river through an outfall sewer terminating in a concrete well from which submerged pipes discharge into the river below the water surface.

Pipe Tunnels

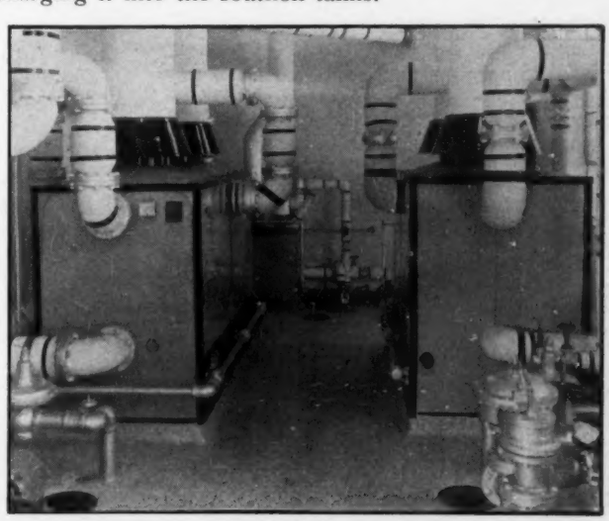
A concrete pipe tunnel extends from the sludge pump house at the clarifiers to the main chemical and power building, and on to the group of digesters beyond. In this pipe tunnel are located most of the essential pipe lines around the plant, including the sludge lines, gas lines, water lines, heating conduits, ventilating ducts, etc.

Digesters

The digesters are four in number and are designed for two-stage digestion. These tanks are 90 feet in diameter and provide approximately 1.65 cu. ft. of sludge storage per capita, on the design basis. The two primary digesters are heated and are equipped with fixed steel dome covers and stirrers of the turbo type. The secondary digesters are not heated and are equipped with floating gas holders. Gas meters and recording thermometers for the digesters are provided in the digester control room located between the two secondary digesters.

Sludge Filters and Chemical Conditioning

Digested sludge is conveyed through pipe lines in the pipe tunnel, back to the basement of the main building to a sludge sump at ground level. In the original plans elutriation of sludge was provided, but this feature was eliminated in the award of contracts, provisions being left in the plant for its installation if later desired. From the sump, sludge is raised by a bucket elevator to an air agitated steel mixing tank where conditioning chemicals are applied. It is anticipated that lime and ferric salt in the form of chlorinated-copperas will be used. Two solution or storage tanks are provided for the manufacture of chlorinated-copperas. These are rubber-lined steel tanks provided with heating coils for raising the temperature of the liquid for the purpose of obtaining a more concentrated solution. Circulating pumps are provided for pumping the copperas solution through the injector of the chlorinators, recirculating the contents of the tank as much as might be desired. A solution feeder is provided for feeding the iron solution from these tanks, the rate of feed being controlled automatically by the speed of the bucket sludge elevator. A weigh hopper is provided over the tanks for weighing copperas before discharging it into the soutlion tanks.



Battery of Automatic Ideal (A.G.P.) Gas Fired Boilers. Two Will Produce Recirculating Hot Water for Digester Heating and General Use; the Third in a Steam Generating Unit.

From the coagulating vats the sludge is carried to two vacuum filters, 8 ft. in diameter by 8 ft. in width, providing 400 sq. ft. of filter surface. The sludge filters, together with the accessory equipment, is housed in the basement of the main chemical and power building. The filter cake discharges on a belt conveyor which delivers it either directly to trucks or to sludge storage bins located alongside the chloride storage building. The latter is a separate structure just north of the main building.

Sludge will be disposed of by trucking to dumps or to city or county controlled farms, at least for the present. Several local firms are negotiating with the city at the present time with a view to taking the sludge cake output for use as a fertilizer base.

Main Chemical and Power Building

The main building, located on a hill-side, houses the sludge filter equipment, aeration basin blowers, workshop and a garage on the lower floor, entered from the rear at plant level. On the second, or main entrance floor, is located the office, laboratory, power room, heater room, chemical feed machine room and chlorinator room. The third floor is given over to chemical storage bins, chemical conveyor equipment and ventilating fans, the pneumatic chemical handling equipment.

The laboratory is 25 feet by 30 feet and is completely equipped for regular routine and research work. It is planned to do the work for all the plants at this laboratory. A constant temperature room, 9 feet by 12 feet, is provided for B.O.D. work and fitted with air conditioning equipment for controlling the temperature. Separate rooms are also provided for laboratory stores and supplies.

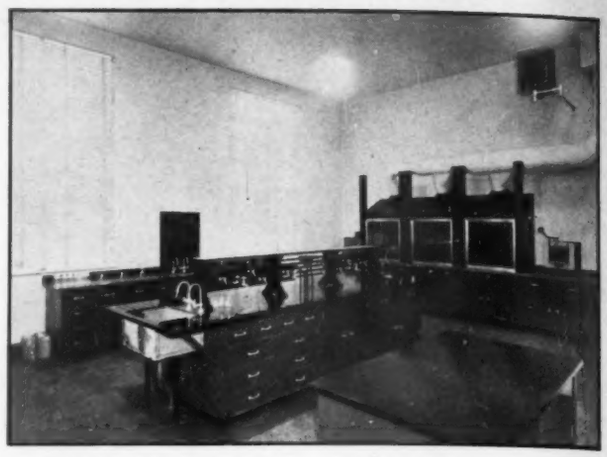
In the power room there are located two 180 H.P. gas engines with generators and the main switchboard panel for the entire plant. Space for a third engine-generator set is provided. These engines will utilize sludge gas and will furnish more power than is needed for the operation of the plant.

Next to the power room there is located a heater room which includes gas heaters for heating the digesters, the building and the copperas solution tanks.

In the chemical feed room are located three dry feeders with hoppers extending to the floor above. These feeders have a capacity of 1000 lbs. per hour each and are designed to feed copperas, ferric sulphate or hydrated lime. In the same room are located two lime feeders and slakers, the larger unit (maximum 2500 lbs. per hour) is designed for feeding pebble lime to the sewage at the chemical mixing basin and the smaller unit (maximum 500 lbs. per hour) is designed for feeding pebble lime for sludge conditioning in the sludge mixing tank, this feeder being automatically controlled by the speed of the sludge bucket elevator.

The copperas feeders discharge into rubber-lined solution tanks equipped with stirrers. These tanks deliver to a pump suction tank where a float control water make-up line is provided. The copperas circulating pumps take suction from this tank and discharge through the chlorinator injectors and back to the solution tank, until all ferrous iron has been converted to ferric. It is possible to apply coagulants or chlorine alone either to the head of the plant in front of the bar screens, to the chemical mixing basin, to the influent of the clarifiers or to the effluent of the clarifiers. There is a separate chlorinator room housing three chlorinators, which have a maximum capacity of 2000 pounds of chlorine per 24 hours each. Two liquid chlorine evaporators are located in a small room adjoining the chlorinator room.

The pneumatic chemical handling equipment is designed to deliver to the sludge bins 5 tons of dry chemicals per hour, from cars on the siding at the plant.



A Portion of the Laboratory at the Clayton Plant. It Will Function as the Central Laboratory for Atlanta's Four Plants.

There are three chemical storage bins provided, each having a capacity of 150 tons. Chemicals are recovered from the bins by means of the same air handling equipment as is used for unloading cars and are discharged to the screw conveyors which, in turn, discharges to the hoppers over the dry feed machines. These hoppers have a capacity of 4 tons each.

On the chemical conveyor floor are located a battery of ventilating suction fans which connect to ducts leading to various parts of the plant to assist in odor control. The fans discharge to a stack through the roof of the building. The duct system makes it possible to exhaust air from the screen building, covered grit chamber, covered aeration basin, pipe tunnel, digester control room, sludge pump room, sludge filter room, heater room and fume hoods in the laboratory.

Chlorine Storage Building

In the chlorine storage building there is provided space for storage of 30 one-ton cylinders of chlorine. In a separate room there is provided space for placing 12 one-ton cylinders on the manifold for use. Both rooms are served with an overhead trolley and hoist which extends to a crane outside, by which the cylinders are picked up from cars. In the basement of the chlorine storage building there is a fan of 15,500 C.F.M. capacity which exhausts the air from either of the two chlorine rooms, passing it through two banks of water sprays, of the air washing type, in an enclosed chamber. The water sprays have a capacity of 600 gallons per minute, taken from the city's raw water supply. This arrangement was adopted in an attempt to absorb the chlorine before discharging the exhaust into the atmosphere in case of serious leaks from the cylinders in the chlorine building. Also in the basement of the chlorine building are located garages for service trucks.

The plant was designed by Wiedeman and Singleton, Engineers, and constructed as a P.W.A. project at a cost of approximately $830,000, the P.W.A. contributing 45 per cent of the cost. The sewer outfall extensions are being completed by the W.P.A., using relief labor.

The City Construction Department designed and supervised the construction of the sewer extensions and supervised the construction of the plant. The work was carried forward under the direction of Mr. Clarke Donaldson, Chief of Construction, and Mr. W. A. Hansell, Asst. Chief of Construction, and Engineer in Charge of Sewers.

THE PURIFICATION DIVISION AT NEW ORLEANS

Features Corrosion Control, Carbon Specifications and Proper Usage, Softening

(Second Installment of a Report of the AWWA Convention)

IN our previous issue was featured the general account of the outstanding and record making 58th Convention of the American Water Works Association, held late in April. The feature position was given the account in WATER WORKS AND SEWERAGE because all who were so fortunate as to attend the convention will readily agree that the report covering this most successful and well proportioned convention deserved featuring.

The initial installment of the report covering technical proceedings included such important topics dealt with in the Plant Management Division sessions as the many sided discussions of "Meter Specifications"—and the need for more meaningful specifications; "Special Consumer Rates"—for sprinkling and off-peak water sales; "The Merit System"—experiences in its application for rewarding outstanding and deserving employees in municipally owned utility systems; "Public Safety Measures"—as developed to enhance safety to the general public in the operation and maintenance of water works and sewerage systems.

The next, and final, installment of this report will cover additional Round Table and Symposium style presentations of such topics as "Water Demands in Air Conditioning," and the like—methods of meeting such seasonal or daily peak demands, most effectively and economically; "The Sewer Rental Method of Financing Sewerage"—and, most interesting, the experiences of Water Departments in handling accounts and collecting sewer rents; "Power"—a comparison between steam, purchased current, and Diesel engines from the standpoint of reliability and economy for pump-station operation.

The report of technical proceedings covered in this present installment will be devoted exclusively to topics dealt with by the Purification Division or in the important joint-session of the Plant Management and Purification Divisions. [Putting the cart somewhat before the horse, in respect to chronological order of the sessions, we will present the Joint-Session proceedings first. Then will follow Mr. Faber's account of proceedings in the Purification Division.—Ed.].

Anti-Corrosionists

Thos. H. Wiggin, Consulting Engr., New York City; Geo. D. Norcom, Consulting Chemist, New York City; I. M. Glace, Consulting Engr., Harrisburg, Pa.

Mains and Services

S. F. Newkirk, Jr., Engr. and Supt. Water, Elizabeth, N. J.; F. N. Speller, Dir. Research, Natl. Tube Co., Pittsburgh, Pa.; C. L. Bogert, Consulting Engr., New York City.

Corrosion Control Feature of Joint Session

The Joint Session of the Plant Management and Purification Divisions was given over to discussion of corrosion and tuberculation problems and methods of alleviating such in mains and services.

"Report of Committee on Pipe Line Coefficients," by CHAIRMAN C. L. BOGERT, Consulting Engineer, New York City.

In the first report of this committee, Mr. Bogert outlined the plan of study under way, which is to emphasize case history studies of the entent of corrosion and tuberculation and the effects of chemical composition of the waters, and/or chemical treatment, in corrosion correction. The effectiveness of chemical treatment in comparison with protective linings for cast-iron and steel pipes is perhaps the most important consideration to be studied. Data from 1,200 tests are to be plotted and studied in respect to size and age of pipe; water quality; biological aspects of tuberculation; the effectiveness of main cleaning, and how far the value may be sustained by corrective water treatment; the economics of all. Already 550 questionnaires have been sent out, to which 75 replies have been received. It is the purpose of A. W. W. A.'s committee to extend and amplify the scope of the work, and the valuable contribution of 1935 by a similar committee in the New England Water Works Association. [It is proposed that, in the end, a joint report be drawn by these two committees for publication by both associations. WATER WORKS AND SEWERAGE joins with Mr. Bogert in urging every operator and engineer to cooperate in the matter of providing case histories for composite study.—Ed.]

As a discussor, L. R. HOWSON (Chicago) suggested, if possible, that some thought be given to a comparison of various corrective treatments of waters of like or similar qualities—for instance lime, chloramination, deaeration, etc., of water taken from the same supply source should prove most helpful in evaluating treatment practice.

MR. BOGERT, plead for such cooperation, and especially thanked the Pitometer Co. for the free use of the many

Here and There—In and Near New Orleans

1. "Jim" Brown, Natl. Water Main Cleaning Co., and Mrs. Brown, Columbus, Ohio; 2. Marsden Smith (Richmond) and Mrs. Shep. Powell (Baltimore) "Launching" to Freeport's Sulfur Mine and Refinery; 3. The Memphis McCords—Genl. Supt. "C. M." and "C. M. Jr." (As to the Ladies: One Is Mrs. "C. M.," the Other the Daughter, But Which?); 4. On the Water Works Special We Snapped Medal Winning "Bill" Mabee and Mrs. Mabee of Indianapolis; 5. In the Next Seat We Found Hayes Kuhns and Mrs. Hayes of Columbus, Ohio—(This Snap Was No "Lead-ite" Cinch.)

dependable records at their command, and knowledge of others that existed.

"The Effectiveness of Water Conditioning in Respect to Tuberculation Rates," by THOS. H. WIGGIN and GEO. D. NORCOM, Consulting Engineer and Sanitary Chemist, New York, N. Y.

Mr. Wiggin, in presenting the first part of the joint paper, explained that it was given purely as "a report of progress" on studies under way to determine the relative effectiveness of corrective treatments in suppressing corrosion and tuberculation. Several case studies were cited, with lantern slides showing the conditions of mains after cleaning, and before and since corrective treatment with lime had been in use for various periods. Both the progressive drop in the closely matched coefficient values (C), and the phototgraphed appearance of the pipes previously cleaned had indicated that the degree of lime treatment employed was limited in its value. Although retarded, tuberculation had progressed with lime treatment to a degree that capacity values of C equal 130 to 140, for the freshly cleaned mains, had dropped to between 100 and 104, with tubercules from ¼ inch height to minute size, after 2 years. Showing, however, that there was some benefit from the treatment, the C values previous to introduction of lime treatment had dropped to between 55 and 90 within a year to 18 months after cleaning.

Mr. Wiggin's conclusions from the several cases studied (none being on highly aggressive waters) were that over-confidence in chemical treatment was not justified until coefficient studies had proved its efficacy. The studies under way had only emphasized the value of cement and bituminous protective linings for water pipes subject to corrosion and tuberculation. He was more convinced than ever that the economies of such protection had been unexplainably neglected.

GEORGE D. NORCOM, co-author, took over at this point to briefly review the corrosion theory and state that elimination of red-water by chemical treatment has *not* stopped tuberculation. Under his observation in the Federal Water Service system were 35 plants employing alkali treatment to produce a water which deposited calcium carbonate film to a slight degree, as revealed by test and inspection. Depending upon the water quality, pH values of between 8.0 and 9.6 were being maintained. The test cases referred to in Mr. Wiggin's report involved Lake Erie water, ordinarily considered a rather passive water, with total hardness of 120 parts, bicarbonate hardness (alkalinity) of 106 parts, CO_2 of 4 parts, and pH 7.1. By lime treatment a depositing water was had at pH 7.9 to 8.0 requiring 70 lbs. (plus or minus) of hydrated lime per m.g. Mains were cleaned after fixing the proper adjustment of lime treatment. In the ensuing 6 months the C value for the 20 inch main had dropped from an average of 137 to average of 132; for 16 inch, however, it had dropped to 126. Examination showed a coating of carbonate scale of corrugated structure, with tubercules actually protruding at spots. Mr. Norcom said that their studies were being continued, and would be extended to include more aggressive waters also. Interesting was the fact that a calcium coating had been found in mains already somewhat tuberculated, whereas the same water had deposited no film on pipes cleaned after the treatment had been started before cleaning. With treated water, tuberculation seemed to be more localized, being more pronounced toward the bottom of the pipes. Such indicated less effectiveness of the original tar-coating where foreign matter deposits and abrasion would be most pronounced.

"Limestone Contact Units," by I. M. GLACE, Consulting Engineer, Harrisburg, Pa.

Mr. Glace told of the effective use of limestone contact units at Dillsburg, Pa., on a very soft mountain water. He briefly described the plant design, and results attained. He likened the limestone contact to the laboratory marble-test on a large scale. Passing through the crushed limestone, the water takes up its calcium carbonate requirement to render it less aggressive. (For details and quantitative data see the article by Mr. Glace in "WATER WORKS AND SEWERAGE" for April, 1938, pp. 293 and 426 of Reference and Data Section.—Ed.) Hardly suitable for very large supplies, in Mr. Glace's opinion, he had found its advantages for small supplies to be simplicity and economy, with an automatic "stop" in respect to possible over-treatment. In addition to altered aggressive quality, the water seemed to be improved in appearance (less color and more sparkle being noted) as a result of the contact effect.

"Correcting the Aggressivity of Zeolite Softened Water," by D. E. DAVIS, The Chester Engineers, Pittsburgh, Pa.

Mr. Davis' paper pointed out that Zeolite softened water first removed all previously laid down hard-scale from pipes and then troubles began in the nature of corrosion and leaks, unless some corrective treatment is given. He cited case histories and stressed the dependability of the recently offered Langelier Index (Univ. of California) as a means of taking the mineral analysis of such waters and determining the extent of aggressivity,

L. C. Billings, Supt. Filtration, Dallas; J. R. Baylis, Physical Chemist, Chicago; M. M. Braidech, Case School, Cleveland. (On Carbon Specs. Their Committee Agreed to Disagree—So Chairman Braidech Released a Volume on the Why.)

and how far to proceed with progressive alkalinization to check the trouble. In accord with his experience, a Langelier Index of —0.6 or lower would not cause corrosion troubles. On the other hand an index of —1.0 or above had been productive of trouble, thus confirming Langelier's claims. Depending upon the mineral content (residual hardiness) caustic soda, alone or with silicate of soda, had proved the most effective treatment in boosting the pH value of such waters. Lime had not been favored because of the hardness increase entailed. The Permutit Co. had recommended silicate treatment in hot water systems to the extent of 166 lbs. per m.g. In municipal systems, caustic soda to raise the pH to 8.1 had been effective where the final hardness was 80 p.p.m. or thereabouts.

H. M. Olson, Chemical Engr., The Ohio Salt Co., Wadsworth, Ohio, who read Mr. Davis' paper, added his experiences which indicated a pH value of 7.5 to 7.8 sufficient when the zeeolite softened water contained a hardness or alkalinity of the water in the system, indicating the dissolving of coatings laid down prior to softening, be watched. As soon as the alkalinity pick-up began to show signs of diminishing it was time to begin corrective treatment to preclude complete removal of the protecting lime carbonate coating from the mains and services. Where mains had been coated with some manganese also, the dissolving action by softened water was materially inhibited. [We might add, too, that the same argument applies to water softened by the lime-soda method, if carried sufficiently far and re-carbonation is practiced.—Ed.]

Paul Weir, Supt. Filtration, Atlanta; Malcolm Pirnie, Consulting Engr., New York; Clinton Decker, Sanitary Engr., Birmingham.

Works and Sewerage" for April, 1938, pp. 428 of the Reference and Data Section.—Ed.)

"Experiences With Pulverized Limestone vs. Lime Treatment," by G. E. Arnold, Purification Engineer, San Francisco, Calif.

Mr. Arnold being prevented from attending, his contribution was briefly presented by L. H. Enslow. In short, large scale experiments with the application of finely pulverized limestone dust to the Hetch Hetchy Aqueduct had proved less effective and considerably more costly than the use of lime applied in suspension. Further study revealed that the limestone dust, even when so finely ground as to pass a 300 mesh sieve, dropped out of suspension too promptly and accumulated on the bottom of the aqueduct. Its continued availability was noted after discontinuing treatment but the cost more

Some Husbands—and, Fortunate Wives

1. *The "Dick" Fords of Haddonfield, N. J.;* 2. *Mr. and Mrs. R. W. Sparling "Metered" from Los Angeles;* 3. *And, Jeff and Mrs. Corydon "Trailed" Down from Providence, R. I., and Then On to Mexico City and Way-Points;* 4. *Also from Yankee-land Came Mr. and Mrs. Theodore Bristol of Ansonia, Conn.;* 5. *G. Webber Knight, Genl. Mgr. of the Natrona (Pa.) Water Co. and President of Pennsylvania's Water Operator's Assn., Brought Mrs. Knight.*

"Experiences With Deaeration," by Sheppard T. Powell, Consulting Chemical Engr., Baltimore, Md.

Mr. Powell briefly set forth the successful control of tuberculation of a 12 mile long steel pipe line, carrying an industrial water supply taken from the Mississippi River near its mouth, the main being exposed to the hot Southern sun and suffering costly rapid friction build-up between mechanical cleanings. At times the chloride content of the water ran to 3,400 p.p.m. After experimentation with acids and inhibitors, and various chemical treatments alongside of degassification of the water in a vacuum tower, the latter method had proved the most practical and economical. Lantern slides showing the sustained carrying capacity of the line over the period since introducing the treatment, as compared to previous graphs between cleanings, were impressive. The vacuum maintained (28 inches of mercury) and water drop within the degassing tower of 6 to 9 ft. has been sufficient to remove all but 0.2 p.p.m. residual oxygen, and essentially all of the free CO_2, producing a water of pH 8.1 or thereabouts. At a hardness 100 p.p.m., and thereabouts, such water had been shown to be essentially non-tuberculating. To further reduce the 0.2 p.p.m. residual oxygen the use of sulphite of soda had proved more economical than an increase of the vacuum above the 28 inches maintained. (For exact details, see "Water

than the lack of immediate effectiveness ruled it out of consideration. To a lesser degree, a combination of lime with limestone dust proved uneconomical and impracticable. The preferred treatment of the very soft Hetch Hetchy water had proved to be that of hardening and pH boosting with lime alone, depending upon the recently started ammonia-chlorine treatment to control crenothryx and allied biological growths on the walls of the steel pipe aqueduct sections.

"Experiences With Lime-Silicate Treatment," by Carl Alexander, Supt. of Water Works, Rome, Ga.

Mr. Alexander, until recently Chemist in Charge of Water Treatment for the Tubize-Chattilon Corp. of Rome, Ga., told of his experience with lime treatment continuously and silicate treatment intermittently applied in addition. Practice for the past 9 years had been to maintain a pH of 8.1 and to apply silicate of soda intermittently—the dosage being that to provide 50 to 60 p.p.m. $Si\ O_2$. On the mill supply, where no corrosion could be tolerated because of the textiles produced, the expense of the treatment had been of secondary consideration. A thin dense scale had been deposited and maintained, in which the silicate played an important role and especially in maintaining hot-water pipes and boiler tubes in the best condition. The part played by the silica seemed to be in the greater uniformity of scale deposit

starting at the treatment plant and extending through the system, plus the smoothness and density of the almost eggshell thin coating which always depreciated with discontinuance of the silicate application. Next to silicate treatment the use of sodium aluminate had contributed the most satisfactory pipe protection and satisfaction in boiler tube maintenance.

"Experiences With Chloramination," by J. WALTER ACKERMAN, Chief Engr. and Genl. Supt., Consolidated Water Company, Utica, N. Y.

Mr. Ackerman's brief discussion, read by L. H. Enslow, recounted the continued efficacy of ammonia-chlorine treatment in checking tuberculation of the 12 mile long Utica supply mains. By lantern slide, Mr. Ackerman revealed the picture of sustained main capacities, revealed by the holding up of the coefficient value at between C = 140 and 130 since the last cleaning of the main some 4 years ago. To meet demands in former years, main cleanings had been required at intervals of 16 to 24 months or whenever the C value dropped to 100. Varying with the seasonal chlorine demand, between 0.5 and 1 p.p.m. chlorine had been required in the ammonia-chlorine treatment to maintain residual chlorine throughout the system in amounts between 0.1 and 0.3 p.p.m. The treatment has been most effective in the main ahead of the standpipe, and now was apparently extending more pronouncedly to the main below the standpipe and through the distribution system. (For greater details and the C value and chlorine dosage graph extended into 1938, see page 424, Reference and Data Section of the April, 1938, issue of WATER WORKS AND SEWERAGE.—Ed.)

1. Jack O'Leary, Sales Mgr., Pittsburgh-Des Moines Steel, and George Gascoigne, Pres. Gascoigne Engrs., Cleveland, Ohio; 2. E. M. Jones, Sales Mgr., Simplex Valve and Meter Co., and L. E. Livingston (Dallas, Tex.), Who Sells "Mineral-Lead" in the Southwest; 3. From Virginia, Suh!—Came Richard Messer, Chief Engr. of the State Dept. of Health and Richmond's Marsden Smith; 4. John O'Neil, Chief Engr. Louisiana Dept. of Health, and Frank "Globe-Trotter" Bachman of the Dorr Co.; 5. From Canada Came the Secretary and President of the Canadian Section, A. E. Berry (Toronto), and A. B. Manson (Stratford).

"Selecting Water Service Pipe," by S. F. NEWKIRK, JR., Engineer and Supt., Water Department, Elizabeth, N. J.

Mr. Newkirk, in discussing the choice of pipe materials for consumer service lines, made it plain that selecciton must be made, in the final analysis, based on water quality and ground conditions. As far as steel and present day wrought iron were concerned there seemed to be little difference in respect to corrosion and chokage rates. In comparing lead with copper tubing and red-brass pipe, lead had shortcomings which copper and red-brass did not suffer. An important consideration was also the matter of lead attack by the water, and resultant lead poisoning hazard. He, therefore, cautioned managers and chemists to make certain by investigation that their particular water was not aggressive to lead before accepting or continuing its use. Interestingly, he had just emerged from a difficult situation, in which a trade association promoting a competitive service pipe and jointing material, had attempted to prove that he was exposing his consumers to serious health hazard by using copper services. In the face of published findings in recent years, indicating the lack of significance of any amount of copper which would be tolerated by the consumer's tasting equipment, the campaign of this organization had not been understandable. Fortunately such tactics failed of their purpose, in having no worthy support by medical authority. As to dissolved copper in drinking water 3 p.p.m. was set as the limit by the Netherland's Water Works Association —probably because of the taste produced by such an amount. As far as zinc from galvanized pipe was concerned, it appeared to be unimportant as a health menace. After giving other reasons, Mr. Newkirk definitely favored as the most satisfactory material, overall, flexible type K. copper tubing and/or red-brass pipe. As to workability, long life, and freedom from both interior and soil corrosion, these materials seemed preferable. Next in order, he chose cement-lined steel pipe if soil corrosion was not the problem, or if effectively protected on the outside with a resistant coating. And, if proven safe to use, he added that lead pipe could be considered as a competitive material.

ROBERT SPURR WESTON, Consulting Engineer, of Boston, who has had long experience with the consumer service problem, in a prepared discussion also cautioned that lead pipe needed watching. If found in the water corrective water treatment should be introduced to limit solution of the lead. Success in this direction was cited by a case history wherein 0.09 p.p.m. lead in solution had been reduced to 0.03 p.p.m. by selected water treatment. Where copper or brass and lead are connected the lead goes into solution. Concerning copper, amounts of copper had been proven an essential element in food or drink, rather than the reverse. On the other hand, nothing good could be said for lead in any amount, was the thought conveyed by Mr. Weston. In brief, he too stated that water quality was an all important criterion in choosing service pipe on both technical and economic grounds.

WALTER A. PEARSE (Racine, Wis.), who is Chairman of A.W.W.A.'s Committee on Service Pipe Materials, said that corrective water treatment left the soil corrosion problem and electrolysis effects unsolved. Standard Specifications for Service Pipes were now being compiled by his committee.

"Developments in Soil Corrosion Studies and Pipe Protection Methods," by F. N. SPELLER, Director of Research, and V. V. KENDALL, National Tube Co., Pittsburgh, Pa.

Mr. Speller reviewed the most recent conclusions reached in the nation wide study of soil corrosion by the Bureau of Standards. Amongst these were the fact that the composition of ferrous piping makes little or no difference in respect to corrosion rates; that copper pipe in sulphate or sulphide areas is attacked, whereas lead is not; in drained soils iron pitting almost ceases after two years, but in wet soils it continues with little slowing down; that bacterial action in soil and water plays a part in corrosion through sulphide or acid production; the soil conductivity test was becoming most reliable in predicting external corrosion rates. Concerning bituminous coatings, nothing less than 1/10th inch thickness could be held reliable protection. Attempts to remove mill scale beyond wire brushing was not wise because of the reliable bond between the residual scale and the metal

beneath. For inside linings cement or coal-tar base enamels, or a combination, seemed preferable; whereas, for outside protection hot blown asphalts were as satisfactory, making permissive less expensive coatings, and desirable heavier ones. Inhibitors, such as phosphoric acid and chromate solutions, had been proven of value as primers in preparation for bituminous coatings. For salt or sulphur waters cement linings had been proven highly resistant. He stressed the importance of the tamped clay "blanket" around pipes traversing cinder fill, mill yards and marshy areas, where sulphate reduction or sulphide oxidation to acid was most likely to be encountered. Mr. Speller, with his usual clarity, summarized his remarks by saying:

(1) Inside protection of mains had for all intent been practically solved by either cement or bituminous linings.

(2) For outside protection—an effective insulating coating, with modern cathodic (electrical) protection for the longer mains, seems to have proved a practical solution to electrolytic and soil corrosion problems. Without the first, however, the latter would prove impracticable.

Topics Handled in Sessions of the Purification Division

Reported by Harry A. Faber*
Associate Editor

Committee Findings

"Specification and Tests for Powdered Activated Carbons," by Prof. M. M. Braidech (Chairman), Case School of Applied Science, Cleveland, Ohio.

This committee, appointed in 1934, presented a comprehensive report of the findings from four years of work. It covers a multitude of points such as definition of powdered activated carbon, manufacture, physical and chemical characteristics, testing, shipping, and specifications. The results of a cooperative study on phenol adsorption and the threshhold odor test, as applied to a variety of waters, are now available in a monograph, to be published by the Association. This study has proven the practicability of the threshold odor test for the control of carbon application as well as for comparison of different carbons for particular waters.

The report stresses the point that the phenol adsorption test method must be followed with much care and absolute precision; that adequate laboratory facilities must be available; that it offers a premium and penalty basis in the purchase of carbons. As a supplementary test for carbon comparison, the threshold odor test has been accepted as an optional method of evaluation. The upper phenol value should be 30 and this supplies an adequate working range.

Specimen specifications from a number of plants are presented, in addition to those recommended by the committee. General requirements are: less than 8 per cent impurities by weight, 99 to 100 mesh size, carbon must be readily wettable, details, of the phenol adsorption test are presented, under which carbon must have 30 as its upper value. Cited as specific requirements: form of phenol value specifications, details of threshold odor test, basis of cost, and the use of a carbon reference sample.

Mr. Braidech's report proposed that a permanent committee be appointed to further clarify carbon specifications and advance more efficient usage, and suggested a number of points which might well be studied. These included: work on the development of taste and odor tests, odor concentration, effect of pH, selective adsorption, the question of carbon deterioration and its prevention.

*Research Chemist, The Chlorine Institute, New York City.

S. B. Applebaum, Vice-Pres., Permutit Co., New York; S. T. Powell, Cons. Chem. Engr., Baltimore; A. S. Behrman, Chem. Director, Intl. Filter Co., Chicago.

L. C. Billings, Supt. of Filtration, Dallas, Texas, discussed the committee findings as of benefit to operators and of value to manufacturers. Evaluation of carbon is still a mystery to many operators, and it cannot be advertised as a cure-all. In instances of strong phenol or of hydrogen sulfide odors it is often impractical to use a sufficient dose to produce removals at any reasonable price. Such committee work should be indefinitely continued because many undeveloped possibilities remain.

He approved of carbon purchase on specification, but noted that certain types of odors are mixtures and that the phenol value had proved insufficient as the single guide to the effectiveness of a particular carbon. The phenol value to qualify in bidding, with the threshold odor test to evaluate carbons and make final selections, he considered a happy combination so far as operators were concerned.

W. A. Helbig, Darco Corp., New York, N. Y., classifield the phenol test as a direct test, the threshold odor test as an indirect test—both tests being reliable for the purpose intended. Increase in odor removal corresponds with increase in carbon dose; in other words, it follows the Freundlich equation. But carbon utilization in the plant may yield only a fraction of the total efficiency indicated by laboratory tests. Many comparative tests, using a reference carbon, have shown that a good phenol rating does not necessarily insure good odor adsorption capacity.

Concerning weaknesses of the phenol test, Mr. Helbig pointed to: water odors not due to phenol compounds, arbitrary long contact time in this test which allows complete use of the carbon's value, phenol concentration having a low odor intensity, phenol value and threshold odor value are in terms which are not mutually comparable.

In the open discussion which followed, Dr. A. M. Buswell suggested the possibility of employing two different grades of carbon for the most efficient odor and tests removal. John R. Baylis cited long experience in which the phenol test had yielded dependable evaluation data. Edw. S. Hopkins proposed further study of the fundamental chemistry involved, as perhaps the most needed requirement in producing the most effective carbons.

In the end, the Division voted approval of the report and specifications as tentative; also, the establishment of a committee to continue the work so laboriously executed by Mr. Braidech and his committee.

"Chloramination," by F. W. Gilcreas (Chairman), State Health Department, Albany, N. Y.

This progress report was read by A. E. Griffin, a member of the committee. A study of chlorine-ammonia effectiveness is being approached from several angles. Forty out of forty-eight states, through Health Departments, reported in reply to questionnaires. The replies show: 30,372 supplies chlorinated, as compared with 536 supplies receiving chlorine and ammonia treatment.

Ratios of chlorine to ammonia are listed on an average as 3 to 1, but vary from 1 to 1 up to 12.8 to 1. In general the use of this method of treatment is reported as effective, and is becoming more extensively adopted.

The committee is studying such phases as case histories, special plant problems, comparison of chlorine and chlorine-ammonia effectiveness, bacterial kills with chlorine-ammonia, the value of copper sulfate used, in conjunction with chlorine and ammonia. A bibliography of published articles indicates that there are a variety of unsolved problems which warrant study. It is hoped that the physical and chemical reactions may receive competent study as well as subjects such as the use of preformed chloramines, and use of various ammonium salts. Since both practical and research fields are to be covered, the committee solicits information and data on actual plant problems which may be studied.

"Coordination of Methods of Water Treatment and Laboratory Control," by GEO. D. NORCOM (Chairman), Cons. San. Engr., and Chemist, New York, N. Y.

Especial reference is devoted by this committee to outbreaks of gastroenteritis, because it was appointed at the 1937 meeting for that particular purpose. However, corrosion control methods are being evaluated and some study is being made of chromates in water as a part of its work. To cooperate in the gastroenteritis study, a committee of the American Public Health Association has been organized, letters have been sent to State Sanitary Engineers, and replies have been received from 27 states and the District of Columbia.

Six states have reported a total of 21 gastroenteritis outbreaks, of which 16 occurred in New York State. In each of these instances coliform organisms were found. Prevalent has been the thought that accepted methods might fail to evaluate gastroenteritis. Certainly, it is not to be construed that the condition is caused by coliform organisms, but the old skeleton of possible "chlorine resistant organisms" is frequently rattled. Arrangements have accordingly been made with Dr. Max Levine, Iowa State University, Ames, Iowa, who will study samples of chlorine resistant organisms sent to him. The chlorine residual which these will tolerate should be given by those sending cultures.

MR. NORCOM said that some of the much-needed study can best be supplied through increased cooperation by State Health Departments. Records are incomplete and it is believed that many disease outbreaks are inaccurately reported as due to water supplies. A more specific study may be accomplished if the U. S. Public Health Service is interested in the problem, since laboratory research and etiology is important. The committee believes that, in the absence of coliform organisms, no proof exists to show water responsible; that outbreaks should not be classed as waterborne unless such can be definitely proved and not taken as proven by circumstantial evidence.

That gastroenteritis is a subject of considerable concern was indicated by the extensive discussion which followed this committee report.

CHAS. R. COX (State Health Dept., Albany, N. Y.) indicated that present practice in laboratory methods of water analysis, which show absence of B. coli, does not necessarily prove the water cannot be responsible for gastroenteritis. Some pathologists believe an unknown pathogen may be found through examination of fecal specimens. In one occurrence, the water supply was filtered, received pre-and post-chlorine treatment, had no B. coli in 10 cc. samples. Following an outbreak of the disease, examination showed counts as high as 1,000 anaerobic organisms per c.c. But the punch was drawn by the much higher incidence of gastroenteritis "of unknown origin" found also in the surrounding country area.

MR. DE JARNETTE (Georgia) asked as to the frequency of sampling which was desirable or necessary, and MARSDEN SMITH (Richmond) asked if outbreaks had occurred where the daily examination of 100 c.c. volume of water showed negative coliform tests. In reply, Mr. Norcom said that a sanitary survey coupled with the personal judgment of authorities in charge must determine the number of samples. Jack Hinman deplored dependence upon residual chlorine tests, and too little bacterial confirmation. W. M. WALLACE described Detroit practice of hourly turbidity, residual chlorine, and bacterial sampling. In times of pollution, the latter may be as frequent as every 15 minutes.

NORMAN J. HOWARD (Toronto) advocated, for many supplies, either continuous chlorine recorders or, preferably, residual chlorine recorders. A recent British Ministry of Health report requires all future chlorine installations to maintain hourly records. In three hourly periods the Toronto supply may change from 1.5 to 3.0 p.p.m. chlorine demand; under such conditions uniform chlorine application would likely permit an epidemic overnight.

With reference to contact time, Mr. Cox mentioned that an absolute minimum of 10 minutes contact should be provided when chlorine-ammonia is applied to high pH waters. He thoroughly approved of super-chlorination, followed by dechlorination, where only short contact periods are available. He pointed out that, under this process, a uniform chlorine application is safe despite variations in chlorine demand.

"Waterborne Outbreaks in the United States and Canada (1920-37) and Their Significance," A. E. GORMAN, Engr. of Water Purification, Chicago, Ill.; and ABEL WOLMAN, Baltimore, Md.

This study by Gorman and Wolman has been reported in two monographs to the A. P. H. A., printed in the journal of that Association, and reprinted by the Wallace and Tiernan Company. The present report, therefore, was read only in summary, by John R. Baylis, in the absence of the authors.

"Features of the New Water Softening Plant for Minneapolis," by J. A. JENSEN, Engr. of Water, Minneapolis, Minn.

Four years of experimental study have culminated in the proper design of plant to meet conditions of upper Mississippi River water. In Spring and Summer this water is soft and colored, while during the winter, it is hard but has minimum color. A rapidly settling precipitate was found to be less effective than a slow forming, slow settling one; however, a high degree of removal could be effected in cone precipitators, such as had been built at the Springfield, Ill., plant.

The full-scale softening plant, designed with 12 precipitators (each 10 m.g.d. capacity), will serve the two filtration plants having capacities of 78 and 80 m.g.d. respectively. Mean hardness of the water is 171 p.p.m. and generally varies from 156 to 187 p.p.m., but such extremes as 99 to 232 p.p.m. have occurred. Mean color is 35 p.p.m. It is proposed to reduce the hardness to 75 p.p.m., and color to 10 p.p.m. When color does not exceed 75 p.p.m. the normal lime treatment will accomplish the desired removal. When color is in exceess of 75 p.p.m., water will be given preliminary coagulation in part or wholly, as required, as then softened.

The new double-cone type precipitators will be mammoth in size: the outer cone of 85 ft. diam. tapering to 58 ft. at the bottom, the inner cone 16 ft. at the top and spreading to 58 ft. on the lower edge which is 4 ft. above the floor of outer unit. Slightly above 23 ft. depth will be main-

tained, and the rise of water will suspend sludge to a distinct line of demarkation. Through mechanical agitation any desired sludge concentration may be maintained. Standard rise is 2 inches per min. with 2 per cent sludge concentration. Only 90 minutes or less detention time is required to produce the results. Speed regulation of all agitators will be controlled at one central point, the concentrated "spent" sludge being discharged to sand beds or lagoons.

Total cost of the new plant will be $2,500,000 but, since municipal softening may be done at one-tenth the cost of individual softening, which has been growing in most hard-water cities, the additional cost over filtration alone may be justified on a per capita basis.

CHAS. R. SPAULDING, Supt. of Water Purification, Springfield, Ill., who developed this type of precipitator, described the use of models. These operate continuously and in his experience gave results almost identical to those obtained with full scale precipitators.

MALCOLM PIRNIE, Consulting Engineer, New York City, pointed to the similarity between these precipitators and plants developed by his organization for Florida cities during the last ten years. The same type of upward flow reaction, by which precipitated material contacts incoming water, is utilized. He gave data on the design of circular basins to provide adequate contact time. Since the precipitated matter is always in contact with dissolved oxygen and is withdrawn continuously, it does not have opportunity to putrefy.

As a progress report, Mr. Pirnie described experiments on studies similar to those at Minneapolis. Existing sedimentation basins of any shape may be made adequate for modern operation by using multiple jets for the influent water. Specifications for such a method were quoted.

"Application of Carbonaceous Zeolites to Water Softening," by S. B. APPLEBAUM, Vice-President, Permutit Co., New York, N. Y.

While older zeolites all contain from 40 per cent to 60 per cent silica, a new carbonaceous zeolite is being made from coal, and hence has practically no silica. The preparation process involves treatment with sulfuric acid and stabilization. Used like the older zeolites for base-exchange reactions, it is larger in particle size, but has approximately the same exchange capacity as synthetic zeolites. Unlike the older zeolites, which cannot be so treated, the carbonaceous zeolite may be regenerated with sulfuric acid and used as a hydrogen zeolite.

Exchange capacity for this purpose is 8,000 to 9,000 grains hardness per cubic foot, and to regenerate 2.75 to 3.0 pounds of acid are required per cubic foot. By writing the reactions involved, Mr. Applebaum showed how sodium zeolites convert calcium and magnesium salts to equivalent sodium salts, which remain in the water. Then, by contrast, he illustrated how the hydrogen zeolite will retain calcium, magnesium—*and sodium in addition*—to leave only carbonic H_2CO_3 acid in the water. It will react with chlorides to leave hydrochloric acid, with sulfates to leave sulfuric acid. In treating carbonate waters all of the freed carbon dioxide is removable by aeration as degasification to leave almost pure water.

These characteristics mean new potential applications: Waters of low pH value, and those high in iron may be treated; higher filtration rates (6 to 8 gallons per sq. ft. per min.) are possible because of the larger grain size; this zeolite adds no silica to the water, as compared to the 1 to 3 p.p.m. added from usual types. A number of particular municipal and manufacturing processes which would benefit from the use of hydrogen zeolite were described.

A. S. BEHRMAN, Chem. Director, International Filter Co., Chicago, Ill., advised caution in universal application of hydrogen zeolite by citing the limitations of the new material, and felt that much remains to be learned. The free hydrochloric and sulfuric acid which will remain in the water may be objectionable unless it is carefully controlled or neutralized. In beverage manufacture or in boiler feed waters this may be particularly undesirable. The cheapest and safest method of calcium and magnesium removal, he contended, is still by lime softening.

W. C. Lawrence, Supt. Filtration, Cleveland, Ohio; Peter B. Ley, Plant Supt. Jamaica (N. Y.) Water Co.; Wm. I. Klein, Cons. Engr., East Orange, N. J.

"Fundamentals in the Training of Sanitary Engineers for the Water Works and Sewerage Fields," by PROF. H. E. BABBITT, Univ. of Ill., Urbana, Ill.

In a scholarly and well-considered paper, Prof. Babbitt described the situation in which graduating sanitary engineers were unable to find employment in the field for which they are trained. At present the A.W.W.A., through short schools, its Journal, and its meetings trains only those already employed.

Not even the most affluent of industries professes to train in fundamentals, but it is essential that the basic training of educational institutions be supplemented and specifically applied by industries. This relation is as true of the water works industry as of the chemical, electrical, or any other industry. The water works manufacturers, he suggested, can offer aid and influence in the training of students as sanitary engineers. Between institutions and industry, both the A.W.W.A. and the A.P.H.A. could offer invaluable cooperation. The water works short course is a palliative instead of a cure. The operator with little or no training, but more experience, obtains jobs at the expense of graduates who cannot offer equivalent experience.

Discussion which followed the presentation of this paper disclosed that honest recognition of the condition and a serious attempt toward its correction should not be far distant.

CHAS. G. HYDE (Univ. of California) said the field of opportunity is limited to state, country, municipal or industrial sanitary engineering jobs. He agreed that few became wealthy or receive more than a competence—but most do feel they are rendering a public service. The interest of all associations affected should be developed to influence the situation.

W. M. WALLACE (Detroit, Mich.) spoke from the standpoint of an employer and pointed to municipal residence rules which often restrict employment. He deplored the lack of chemical training so generally found in so-called sanitary engineer graduates.

EDW. S. HOPKINS (Baltimore, Md.) in a similar vein indicated the value of distinguishing between a sanitary engineer and a chemically trained man capable of supervision and operation.

CHAS. R. COX (Albany, N. Y.) said that the condition emphasizes the failure of educational training. Short schools frequently provide a false sense of education; and, in such schools, and in operator licensing, the lack of uniformity must be ironed out. He added that an active

committee of the A.W.W.A. to look into these questions appeared to be essential.

"Operation of the Chickasaw, Alabama Filter Plant," by J. E. JAGGER, Vice-President and Chief Engineer, Ala. Water Service Co., and A. CLINTON DECKER, San. Engr., Tenn. Coal Iron & R.R. Co., Birmingham, Ala.

The problems of color removal and of corrosion control are particularly important at this plant. In 1928 the design, which initially provided only for sedimentation and chlorination, was recognized as inadequate by the Alabama Water Service Co. who acquired the plant franchise at that time. During construction of filtration units in 1929, chlorinated copperas was suggested for coagulation by L. H. Enslow of the Chlorine Institute. Color removal was the criterion and 0.7 gr. per gal. of ferrous sulphate (copperas) with sufficient chlorine to oxidize it completely, and with prechlorination to oxidize reducing compounds, proved effective in the remodelled plant.

In 1936-37 it was realized that the distribution mains were accumulating incrustation. A study was carried out to determine whether the existing coagulation was proper or whether it was responsible for the incrustation, and also to determine the proper method of red water elimination. It was found that lime addition to the filtered water returned some of the color and a floc was found. Lime could be used ahead of filtration, but only after formation of the complex iron-color floc, but existing facilities did not permit effective lime addition. Another fault was detected in the discovery that residual chlorine was ordinarily present in the influent water only as far as the entrance to the mixing basin. Reduction of ferric to ferrous iron consequently occurred in the basins. This could be precipitated if a pH of 10 were maintained, but color removal was then very incomplete. Reduction of iron and passage through the filters did not occur as long as residual chlorine was present. Experiments with alum and sodium aluminate as coagulants showed the color to return when the pH of the water was raised.

It was shown that with effective pre-chlorination and the provision of adequate lime mixing devices in the coagulation basins proper and uniform coagulation with chlorinated copperas was had. Additional chlorine is now applied in the mixing basin, and a uniform effluent of zero turbidity is now obtained. The pipe incrustation has been shown to be due to the original unfiltered water, further aggravated by insufficient lime for proper pH correction.

A. E. GRIFFIN, Wallace and Tiernan Co., Newark, N. J., discussed some details of the study which was carried out. Color of the water, normally 25 p.p.m., is increased by rain to figures as high as 250 p.p.m., and the water may become as acid as pH 4.0. It appeared that immediate and complete formation of color-floc in the acid range was essential. Chlorinated copperas dose varies from 0.5 to 3.0 gr. per gal. requiring 1 pound of chlorine to each 6 pounds of copperas for certain oxidation and maintenance of a chlorine residual. With secondary chlorine application in the mixing basin a slight residual carries through to the top of the filters. The filter units are now in excellent condition and crenothrix growths, formerly present in the coagulation basins, and filters, had disappeared.

"The Use of Clay in Coagulation and Taste and Odor Control," by PAUL WEIR, Chief Chemist, Water Dept., Atlanta, Ga.

To the water works operator clay is a new, non-chemical material which forms an absorbent floc with alum. Such bleaching or absorbing clays may function to increase the rapidity of floc settling, to reduce color, to remove some tastes and odors, and to produce some softening of hard waters. These are natural, surface clays of which Fuller's Earth and Bentonite are examples—the latter is especially applicable as a coagulant with magnesium sulfate.

One of the first successful users of such clay was Chester, Pa., where 43 pounds per m.g. (cost $.35) proved effective during cold weather in producing better floc formation. At Rome, Ga., in supplying water for rayon manufacture, the turbidity must be reduced to 0.1 p.p.m. or less. Raw water turbidity varies from 20 to 2,000 p.p.m. and, using from 40 to 60 lb. clay per m.g. with alum, filtered water meets this requirement at a reduced chemical cost.

At Atlanta, increasing pollution of raw water added to inadequate mixing and settling periods had resulted in taste and odor complaints. While activated carbon would correct taste and odor, it proved of no value in floc formation. The application of alum and clay, simultaneously, has now been used, when the turbidity of the raw water falls below 100 p.p.m., for the past 4 years. Carbon application has been reduced as a result, and the clay has little or no effect toward absorbing chlorine. Ten to thirty per cent in filtration efficiency has been accorded, with color removal being almost directly proportional to the dose of clay. Price of such clays was given as from $20 to $30 per ton.

R. I. DOBB, Chemist, Chester Water Service Co., Chester, Pa., prepared a discussion which was read by J. V. Kelly, Darco Corp., New York. Use of clay at Chester was started in 1930 and, while application is discontinued during periods of good water, decreased chemical cost is indicated when it is again applied. Both clay and activated carbon will remove tastes and odors at the Chester plant.

1. Carl M. Hoskinson, Chief Engr., Water Dept., Sacramento, Calif.; 2. H. J. Schneider, Supt. Filtration, Oshkosh, Wis.; 3. J. J. McCarthy, Monsanto Chem. Co., Boston; 4. R. F. Goudey, Chief Sanitary Engr., Water Dept., Los Angeles; 5. A. A. Kramer, L. A. Solomon & Bros., New York; 6. F. L. Coventry, Supt. Purification, Mattoon, Ill.; 7. Earnest Vogt, Sales Mgr., Vogt Mfg. Co., Louisville, Ky.; 8. J. H. Henderlite, Supt. Filtration and Sewage Treatment, Gastonia, N. C.; 9. John P. Harris, Industrial Chemical Sales Corp., Chicago.

"Enhancing Efficiency and Economy in Activated Carbon Application," by Marsden Smith, Engr. in Charge, Bureau of Water & Elec., Richmond, Va.

While the direct and secondary effects of activated carbon application are now completely proven in value, much remains to be learned concerning its proper application. Mr. Smith suggested a wide variety of ideas for research on the subject.

In most plants, insufficient study is devoted to selecting the point of carbon application. While it is general practice to apply carbon either before or with the coagulant, the author cited his reasons for believing carbon application immediately before filtration to be the most effective and economical procedure. If carbon is included in floc, its adsorption efficiency would seem to be reduced; if advantage is first taken of the ability possessed by floc to remove odors, the subsequent addition of carbon should be more effective. In any case, the desirability of a carbon film on filters is generally admitted since odorous substances must then intimately contact carbon in passing through. Carbon is more effective in acid waters, and the increase in acidity following coagulation should be utilized.

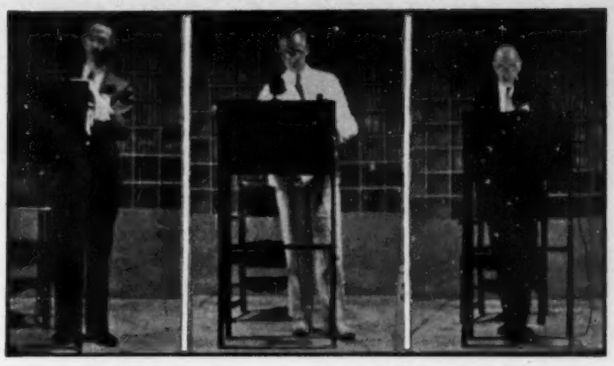
While sludge stabilization is advocated as an advantage, it was pointed out that carbon can absorb odors only after putrefaction has occurred, that prechlorination or continuous sludge removal is more desirable to prevent putrefaction. It appears desirable to prechlorinate even if odors are intensified, because they may then be removed by carbon, rather than develop upon post-chlorination. The bulk or "batch" application of the entire carbon dose (per filter run) to a filter after each washing appears to require less total carbon. These points, and more, as developed by Mr. Smith at the Richmond Filtration Plant composed a most practical sounding paper which will make interesting reading when printed in full.

John R. Baylis, Chicago, Ill., disagreed as to the savings possible in general applications by the batch method advocated, but does advise study of the most desirable point. The threshold odor of 6, proposed as permissible by Mr. Smith, he believes too high. Some consumers would detect an odor intensity of 4 and, to be safe, it should be maintained at an intensity of 2. He indicated that when extreme odors are encountered sufficient carbon could not be added to be effective. A carbon saving of 10 to 20 per cent should result from split application, in Mr. Baylis' opinion, but he offered no supporting data in confirmation.

Chas. Spaulding described a new method employing 10 ml. dilutions in petri dishes for threshold odor determinations. The dishes are warmed in an incubator for 15 minutes, then smelled directly. He agreed that a threshold odor of 2 is preferable to one of 6.

"A Unique Iron Removal Plant," by Peter Ley, Plant Supt., Jamaica Water Supply Co., Jamaica, N. Y.

The limited space available and proximity to residences prohibited the use of coke-tray aerators for iron removal and led to the adoption of a Layne pressure filter for the purpose. Water is supplied from two wells having a combined capacity of 2.95 m.g.d. Four vertical steel filters, 10 ft. by 15 ft. 4 in., welded throughout and with perforated steel plate underdrains are provided. Stainless steel wire cloth supports the filtering medium which is 50 per cent sand and 50 per cent calcite, both 1.5 mm. in effective size. These units are designed to operate at 5 gal. per sq. ft. per min. and this high rate has even been exceeded, with satisfactory results.



Speakers in Action

L. L. Hedgepeth, Penna. Salt Mfg. Co., Philadelphia; I. M. Glace, Consulting Engr., Harrisburg, Pa.; F. N. Speller, National Tub Co., Pittsburgh, Pa.

Above the 48 inch layer of sand and calcite is supported a layer of lava, also 48 inches deep, which acts as the contact material. As water flows downward through the lava, compressed air is diffused upward at a pressure a few pounds greater than the influent water pressure. Air at the rate of 0.015 cu. ft. per gallon of water is required, the exhaust air being conducted to a discharge above the roof. Hydrogen sulfide is completely removed from the water during aeration. Two air compressors, each having a capacity of 80 cu. ft. per min. at 50 pounds pressure and driven by 15 h.p. motors, are provided.

To cut down power costs of the compressors, tests of chlorine for oxidizing the iron were carried out. The chlorine proved as effective, providing a residual of 0.05 p.p.m. was maintained in the water just prior to its contact with the lava. Cost of chlorine required was slightly lower than cost of power for operation of the air compressors.

Monthly chemical analyses, from June, 1937, to February, 1938, show iron content of the raw water to vary from 1.4 p.p.m. to 0.95 p.p.m.; in the filtered water from 0.0 p.p.m. to 0.08 p.p.m. Total cost of the 2.0 m.g.d. plant was $52,597 and operation cost (exclusive of depreciation and amortization charges) averages about $29 per million gallons.

William I. Klein, Cons. Engr., East Orange, N. J., who had charge of the design and erection of the filter units, discussed the paper. The double treatment provided in this plant, all entirely under pressure, eliminates double pumping. The design includes the effective air wash on the filters, limiting wash water consumption to 0.4 per cent and giving filter runs of 72 hours. Iron removal plants of this type, treating waters of 5 to 15 p.p.m. iron, have been in operation in China for five years.

Dr. F. E. Hale, Dir. of Laboratories, Water Dept. of New York City, said the plant had operated successfully from the start, but that it had certain disadvantages. Iron removal is not quite complete and the carbon dioxide is very ineffectively removed. The water leaves with an excessive oxygen content and he believes chlorination more desirable to carry out the oxidation, in addition to being more economical. Not only would this reduce the objectionable oxygen content, but prevention of the growth of crenothrix is another worthy consideration in employing chlorine for oxidation. (We should like to take this opportunity to add that in chlorine oxidation of manganese and iron, later removed by contact filtration, a small residual of chlorine is more effective than is too great excess.—Ed.).

TRITURATION OF SEWAGE SCREENINGS

Operating Experiences at Oneonta's Sewage Treatment Plant

By WILLIAM W. WATKINS

Engineer and Supt.,
Water Works and Sewage Disposal,
Oneonta, N. Y.

The Author

IN November, 1933, Oneonta, a city of about 13,000 people, in Southern New York State, put its new sewage treatment plant into operation. The plant consisted of a mechanically operated bar screen, settling tanks with mechanical sludge removal, separate sludge digestion tanks (the gas being used for heating the digestors and gas apparatus room), and glass covered sludge drying beds. Due to lack of funds, the storm water removal problem was not taken care of as rapidly as was hoped. In 1936 the trunk sewer was cut into and a simple flowing through grit chamber was installed.

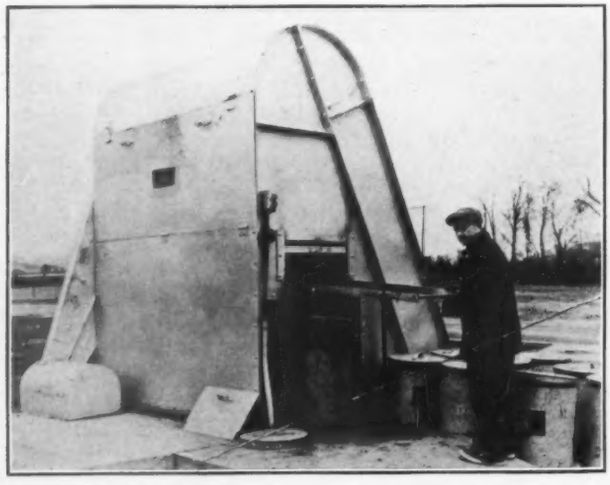
The above is a brief descripiton of the Oneonta plant, which has survived two major floods and one minor flood wave caused by an ice jam in the Susquehanna River, which receives the effluent from the disposal plant.

Mechanical Screen

When the plant was constructed, the screen chamber was equipped with a "Rex" Mechanical Bar Screen, supplied by Chain Belt Co. of Milwaukee. This screen was operated automatically by time clocks, set to start and stop the screen mechanism at such intervals as experience had shown to be necessary.

Varying conditions in the sewage flow caused too much head loss through the screen and corresponding changes in velocity in the settling basins, so, in 1935, the screen was equipped with a direct operated single float which resulted in a more uniform flow through the screen and the settling basins.

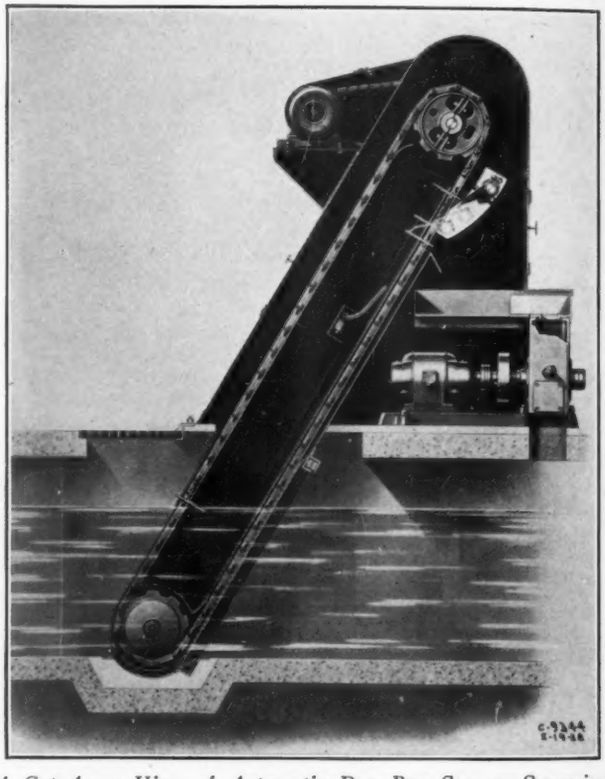
At Oneonta, as at most sewage plants, the real problem has not been that of *removing* the screenings from the sewage, but that of hygienic *disposal* of the screenings removed.



Rex Mechanically Cleaned Bar Screen as Originally Installed. Now We have "Tied the Can" to the Can-System.

One Method of Screenings Disposal

For four and one-half years—when weather conditions permitted—we dug ditches and carted the screenings out for burial in what the men call the "graveyard"—a piece of city-owned property adjacent to the plant and about 200 yards away from the screen. If too much ditch was dug in the fall it caved in before it was used up. After the ground froze it was economically impossible to dig more ditches until spring. Consequently in the spring it was necessary to spend a week or more with a crew of men and trucks getting rid of the screenings that had been dumped but couldn't be buried.



A Cut-Away View of Automatic Rex Bar Screen, Screenings Pan, and Triturator. (Unfortunately We Were Unable to Secure a Photograph to Effectively Picture Our Installation. This Catalog Picture, However, Reveals the Arrangement Nicely. The Triturated Screenings Drop Through the Small Hole in the Slab on the Right to the Sewage Flowing Beneath.)

The accompanying table gives the sewage flows and volume of screenings handled daily during the years 1935, 1936, and the first half of 1937. It will be noted that the daily average of screenings removed has varied widely from a maximum of 33.4 cubic feet to a minimum of 4.43 cubic feet. And on one occasion (not storm flow), the total screenings for one day was 66 cubic feet.

DAILY AVERAGES FOR THE YEARS INDICATED

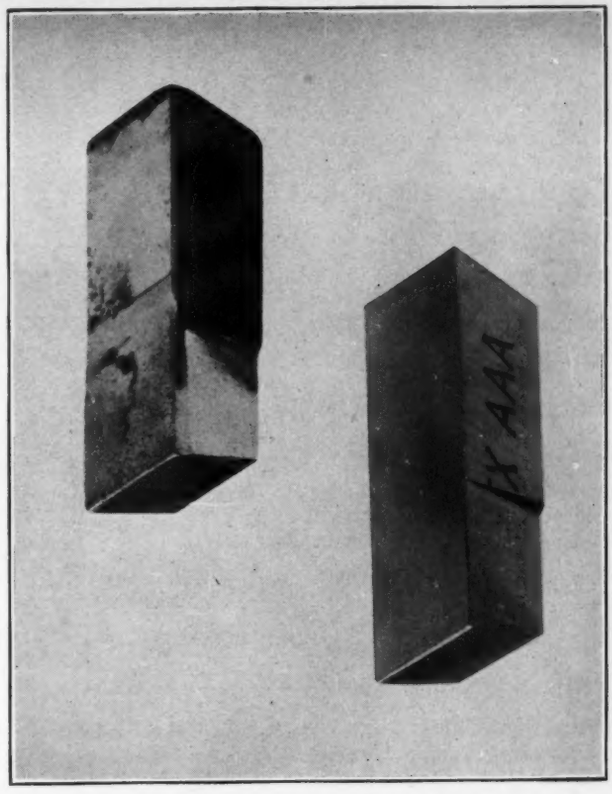
	Flow—M.G.D.	Screenings in Cu. Ft.	Gas Produced Cu. Ft.
1935—			
January	3.532	10.00	2,363
February	3.130	17.14	600
March	4.033	20.90	564
April	4.903	24.9	1,396
May	3.569	14.87	3,642
June	2.254	6.4	3,220
July	3.795	5.21	13,064
August	1.991	4.43	6,926
September	1.282	5.2	5,570
October	1.150	8.02	3,907
November	3.018	12.53	2,523
December	2.760	13.1	671
Average	2.868	11.90	4,287
1936—			
January	2.590	20.20	622
February	2.525	19.24	358
March	2.643	32.60	454
April	3.092	33.40	....
May	1.652	10.08	1,625
June	....	....	1,790
July	.694	26.97	525
August	.965	6.50	4,777
September	.806	5.63	10,166
October	1.091	5.51	7,387
November	1.759	9.60	2,130
December	1.773	13.45	961
Average	1.781	16.65	2,799
1937—			
January	2.566	18.70	670
February	2.153	14.50	2,230
March	1.582	14.80	658
April	2.447	19.00	716
May	1.990	9.77	2,693
June	1.719	6.00	6,373
July	1.805	Triturator Running	10,458
August	1.830	" "	7,670
September	1.889	" "	14,043
October	1.515	" "	7,854
November	1.484	" "	5,310
December	1.492	" "	7,590
Average	1.953	13.79	5,522
1938—			
January	1.486	Triturator Running	5,401
February	2.098	" "	5,150
March	1.289	" "	6,658
April	1.483	" "	9,563
Average	1.589		6,693

With such erratic quantities of screenings it was necessary to keep a large amount of open ditch available at all times, as the operator did not have time to dig his own ditches as required. In addition to the extra cost of ditching it was necessary to have a small truck convenient at all times in order that the full cans of screenings might be emptied and not allowed to accumulate for too long periods.

Burying the screenings took about 2 hours of the operator's time, besides the extra help for ditching and the cost of the truck, making the total cost of handling the screenings about $2.00 per day. Since there is no definite relation between sewage flow and screenings handled, costs per million gallons have little meaning, and therefore have not been recorded.

And a Markedly Different Method

Early in 1937 it was decided that the cost of handling screenings was too high and that something must be done. In coming to this decision, the element of nuisance admittedly had a bearing. After a survey of the field for satisfactory equipment for shredding or macerating screenings for treatment with the sewage, a No. 2 "Rex Triturator," manufactured by the Chain Belt Company of Milwaukee, was purchased, and installed in June, 1937, for shredding all screenings removed by the automatic bar screen.



Two Cutting Teeth from the Triturator, Before and After Re-Sharpening. (Judging from the Slight Rounding of the Cutting Edge of the Tooth on the Left, After 10 Months of Service, as Compared with the Re-Sharpened Tooth on the Right, We Now Have Some Doubts That Re-Sharpening After This Period of Service Can Be Justified. These Teeth, Designed for High-Speed Cutting of Wire Nails, Bones and the Like, Along with Rags, Sticks, etc., Are of Extremely Hard Alloyed Steel.)

The "Triturator" has been operated every day since its installation. It has saved time for the operator, money for the city, and has gotten results in digestion that we had not expected, but which are very gratifying—see tabulated digester gas yields which reveal greater uniformity and higher values.

Benefits from Trituration

From an operating standpoint, the time required by the operator for putting the day's screenings through the Triturator is about one-half hour to one hour—instead of the two hours or more formerly required to bury the screenings. The operator has the saved time to devote to less objectionable and more valuable duties.

From a sanitary or cleanly standpoint, there is no comparison between the old and the new methods. There are now no cans to fill up, to slop over in trucks, to be washed up when empty, or left to draw flies.

From a strictly monetary standpoint, trituration of screenings shows a money saving benefit which can be actually measured. Some of these follow.

The cost of ditching is eliminated. The use of a truck is no longer necessary. These combined items have figured $1.73 per day at Oneonta. Against this is the cost of power and water consumed by the Triturator. Maintenance is not figured in either case, because such has been negligible. The operator has at least an hour more time available each day, and has been able to do some of the work for which we formerly had to hire extra help from time to time.

At an estimated consumption of 25 gallons of water per minute and forty minutes' operation per day, the cost of water at current retail rates is 13 cents per day. A five horse power motor, running at full load, will con-

sume about 4.5 K.W.H. per hour. This figures twenty-eight cents per day at current rates paid. This makes a total additional cost of forty-one cents per day, not counting in depreciation and interest charges.

Gross Savings by Trituration	$1.73
Less power and water cost	.41
Net savings by Trituration (per day)	$1.32

Annual Operating Cost and Savings

From the time that the plant was put in operation until the Triturator was installed, the average daily quantity of screenings has been 12.88 cubic feet. While there is no way of measuring the screenings, it is reasonable to assume that the same average would still hold. To arrive at the cost per cubic foot of triturating screenings, the maintenance cost will have to be estimated, as there has been no maintenance yet except the resharpening of one set of teeth, which is just now now being done after ten months of service and feeding to the Triturator all materials removed by the bar screen.

Re-sharpening teeth and reserve for parts replacement	$ 22.00
Water cost per year	48.87
Power cost for year	102.20
Time of operator	124.00
Depreciation at 10% per year	79.00
Total yearly cost	$375.07
Average daily cost	1.03
Total cost per cu. ft. screenings	0.08
Gross yearly cost of burying screenings	$813.00*
Gross yearly cost of triturating screenings	375.07*
Net saving by trituration (per year)	$437.93

*Including operator's time.

This means that the savings will have paid for our Triturator in less than two years' time.

Gas Production

The benefits of trituration from the operating, sanitary and financial standpoints have been presented. There is one other point to be considered, that is, the effect on the general operation of the plant.

There is no noticeable difference in the settling tanks except in the appearance immediately after the Triturator is operated. The shredded screenings can be noticed on the surface of the tanks, but within an hour this has settled out.

Taking the ten months since the Triturator was installed, the gas production has averaged 7,262 cubic feet per day. The production in the corresponding preceding ten months was only 3,022 cubic feet. How much of this average increase in gas production can be attributed to the additional solids and, how much to some minor changes in operation, is hard to say. Howver, when the weight of screenings is considered in relation to the total amount of settleable solids in the sewage, triturated screenings reaching the digester must be given credit for a calculated 50 per cent of the gas increase, if not more.

From this writer's experience, it can be said, with emphasis, that the successful shredding or grinding of screenings is one of the outstanding advances in sewage treatment of the past five years. No simpler disposal can be imagined than the grinding and return of all screenings to the sewage. No matter from what angle it is looked at, operation, cleanliness or costs, disposing of screenings by trituration is a success and is the solution to one of the most noisome and unsightly operations in modern sewage treatment practice. We at Oneonta feel that this endorsement of screenings maceration and the Rex Triturator is highly justified. And we hope that it may benefit others who have the same problem that we have had at an otherwise satisfactorily operated plant.

▼

LOS ANGELES' NEW REPAIR AND CONSTRUCTION TRUCKS

This is a picture of one of the new repair and construction trucks designed by the Los Angeles Bureau of Water Supply.

The body is the conventional type mounted on a cab-over-engine chassis, this type of chassis being close coupled is especially suitable for work in crowded districts where parking space is limited. Also, the driver has better vision and can maneuver the truck more easily due to its short wheelbase. The body is entirely of welded steel construction. The roof is aluminum painted outside and insulated inside against heat. The open upper half of the sides may be closed by canvas curtains during the rainy season. Drinking water jug, lantern rack, and kerosene tank are carried above the tool cabinets. All the frequently used tools are kept in the cabinets on the right (curb) side. Shovels are stored in the boxes below.

A pipe vise swings out of the lower rear box and locks in the working position.

The left hand side of the truck has bins for pipe fittings. A pipe tunnel runs the full length of the body,

Repair and Construction Truck of Los Angeles Bureau of Water Supply.

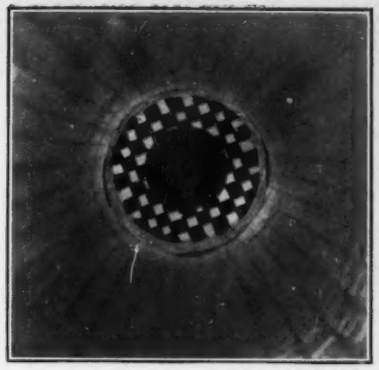
with open ends for carrying long sections of pipe. The side boards on the rear deck are removable. A ¾ davit crane is useful in raising gate valves and other heavy loads to the deck space. A rubbing rail protects the side from damage.

On the right side of the truck, the rear bumper forms a step making access to the truck easy for members of the crew, who ride on upholstered seats set crossways in the aisle.

A backfiller is incorporated in this truck. A friction clutch winch is located behind the cab with controls in the cab operated by the truck driver. The cable from the winch goes through the fairlead mounted on the front bumper (visible in picture) and pulls in the hand scraper, or moldboard, with its load of earth. The winch clutch is then released and the scraper operator pulls back on the scraper, ready for a new bite of earth.

All tools and fittings are easily accessible on these trucks, saving much time over the old type of water construction truck, which was usually cluttered up with tools and supplies.

[For this photograph and description we are indebted to Wm. W. Hurlbut, Engr. in Charge of Distribution, Los Angeles.—Ed.]



Interesting to Visitors and Operators, Alike, Is the Central Sight Well.

BRISTOL'S NEW FILTRATION PLANT*

Patterned After "America's Most Unique Filter Plant" Conceived by the Late Robert Morse

By JAMES A. NEWLANDS
Consulting Engineer, Hartford, Conn.

The Author

THE city of Bristol, Connecticut, has a population of about 33,000, with approximately 30,000 served by the Water Department. The average daily water consumption, completely metered, is about 2,250,000 gallons, of which 45 per cent is used for domestic purposes and 55 per cent for industrial and municipal requirements. The supply is obtained from five upland reservoirs located on Poland River, or its tributaries, at points one-and-a-half to eight miles from the city.

First developed by a private water company in 1885, the plant was purchased by the city in 1914 and has since been operated by a Commission of three citizens. As long time service on municipal commissions is the exception rather than the rule, it is of interest to note that the present chairman, Mr. Charles L. Wooding, was one of the original members. The secretary, Mr. William E. Tracy has been a member of the Commission for eighteen years, and Mr. Townsend G. Treadway has served for eight years. Mr. G. E. Laurie, as Superintendent, has been in continuous charge of operations for the past seventeen years.

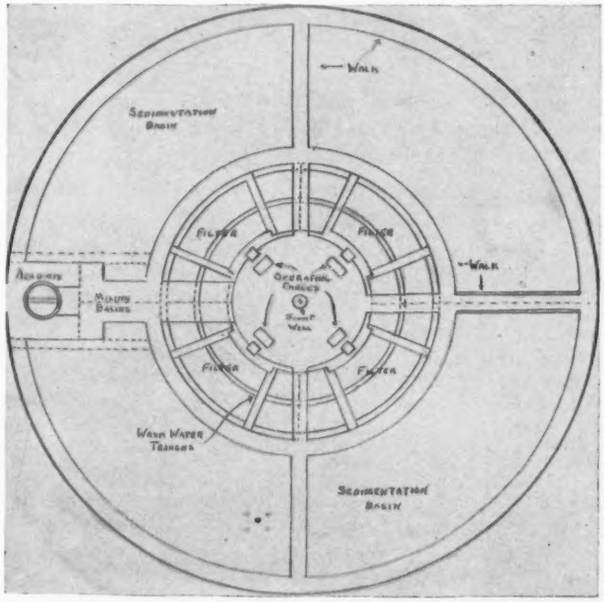
The Commission has continued a policy, started by the original company, of purchasing properties adjoining the reservoirs and their tributary streams in order to eliminate, so far as practicable, direct contamination of the water. Numerous houses and their accompanying barns and outbuildings have been purchased and removed. Areas near important highways have been protected by fences. The Department now owns 3,525 acres of land, representing approximately 54 per cent of the total drainage area of 10.2 square miles. In addition to this method of protection, the water has been chlorinated since 1923 but, until completing the present plant, has not been filtered.

Although these measures have been effective in safeguarding the sanitary quality of the water, the supply, like many other surface waters has, at times, been unsatisfactory because of objectionable tastes, odors, and discoloration. Continuous copper sulphate treatment of the water entering the distributing reservoir during the summer months has been used with fairly satisfactory results in the control of tastes and odors, but consumer objections to discoloration have persisted.

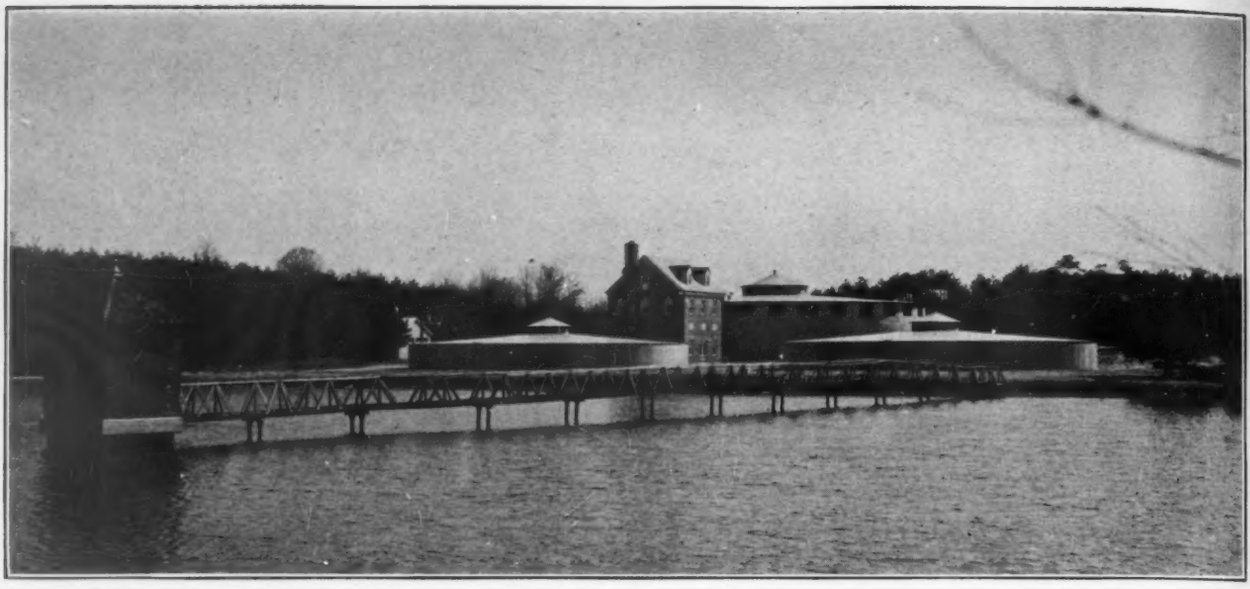
During the early part of 1936, while investigating methods for satisfying objections to the physical appearance of the water, the attention of the Bristol Water Commission was directed to the use of rapid sand filters, several of which were then under construction for other Connecticut cities. Consideration was given to both the standard type of concrete plant and the novel Morse type plant, constructed of steel, which was developed by the late Robert B. Morse, when Chief Engineer of the Washington Suburban Sanitary District.

Water Works and Sewerage—June, 1938

*A paper read before the New England Water Works Assn., April 1938, and published by permission of the Editor of the *N.E.W.W.A. Journal.*



Plan Sketch of Annular Coagulating Basins, Filters and Operating Gallery at Center.



Bristol's New Morse Type Filter Plant from the Lake. Note Wash Water Tanks (Right Foreground) in the Trees Above the Plant.

In determinating the merits of the two types of construction it was recognized that while the modern gravity rapid sand filter plant has ordinarily been constructed of concrete, the successful use of iron and steel pressure filters, first at Atlanta, and since at many other places during a period of forty to fifty years, has clearly demonstrated that, from the standpoint of long life, iron and steel are not without merit for water purification projects.

Although corrosion of iron and steel surfaces in water works structures has been an objectionable feature in the past, recent years have seen this problem materially lessened by improvements in the quality of coatings now dependably employed to protect the surfaces of such structures. The production of stronger and better steel structures has also been made possible by the remarkable advances in the development of welding technique. Both gas and electric welding processes are now used in the fabrication of many complicated steel structures, ranging from battle cruisers and ordnance, to welded pipe lines; also, high pressure steam boilers and other units built for continuous safe performance and long life.

Morse's Development of New Type of Filter Plant

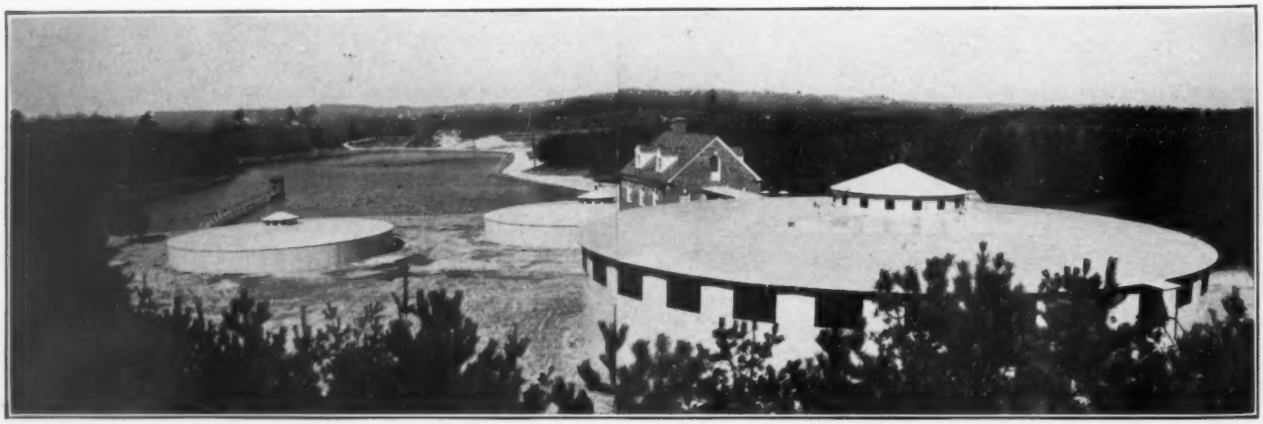
As previously indicated, steel pressure filters have been used in the purification of water over a period of about fifty years, but it remained for the late Robert B. Morse to direct attention to the practicability of fabricating concentric circular steel tanks for gravity type filters. This type of plant he designed and had built for the Washington Suburban Sanitary District at Burnt Mills, Maryland, about four years ago. A second unit for the District has since been constructed.

Following two visits to the Burnt Mills plant and, also, to a new filter plant of concrete construction, the Commission accepted the writer's report advising the installation of a 5 M.G.D. plant similar to that at Burnt Mills, but with certain changes in design, some of which were necessitated by differences in local conditions.

A contour map of the site was prepared by City Engineer Carleton E. Buel of Bristol, and the contract was let to the Chicago Bridge and Iron Company on December 30, 1936. Grading for the foundations was begun on March 26, 1937 and the underground piping and reinforced concrete mats for the filter unit and clear water tanks were completed on June 1. Erection of the superstructures was started on May 18, and the plant is now in operation.

Design and Construction

It is of interest to note that as a result of very thorough tests of each steel compartment no leaks were found in the welded sections. The few small leaks at



The Plant from Atop of One of the Twin Wash Tanks. Nearest the Lakes Are the Twin Clear Water Tanks; Immediate Foreground the Coagulating Basin and Center Annular Filter; Beyond Is the Control Building with Chemical Feeders, Laboratory and Pumping Station Beneath.

pipe flanges were stopped by tightening up the flange bolts.

Although the shape of the plant differs from the usual rectangular tanks used in concrete construction, the operating units are the same. The filters are equipped with the usual rate controllers, loss of head and rate of flow gauges, and all valves in daily operation are hydraulically operated from tables on the central operating floor.

In order to increase the pressure head in the city by about ten feet, the raw water is elevated from the reservoir level to the filters by two one and a quarter and two two and a half million gallon pumps. These are operated as required to supply one or more of the four filter units, each of which has a capacity of one and a quarter million gallons per day at a filtering rate of two gallons per square foot of sand surface per minute. The pumps are motor driven by purchased power but it is proposed to later install Diesel engines and generators as an additional source of power.

Duplicate Unit Design

Dry feed chemical machines supply coagulants to the raw water line in the pump house. The treated water flows to two Vogt "Aer-O-Mix" units and two mixing tanks which have a detention period of fifteen minutes at maximum rating. The water then discharges over wiers at each side of the mixing tanks to the two coagulating basins which have a detention period of four hours. At the outlet ends of the semi-circular coagulating basins the water passes over wiers to down-take header pipes, then to the filter units as required. The aerating, mixing, and coagulating basins have been provided in duplicate, so that any unit can be taken out of commission when necessary without interfering with the general operation of the plant. Likewise such design makes it possible to study performance of various chemicals used in conditioning the raw-water for filtration, taste removal, etc.

The filter effluent discharges to the circular sight well in the center of the operating floor. To the filtered water, discharging into a twenty-inch line through the pump house, lime is added to correct corrosive characteristics before the water passes to two clear water storage tanks. These circular steel units have a capacity of four hundred thousand gallons each.

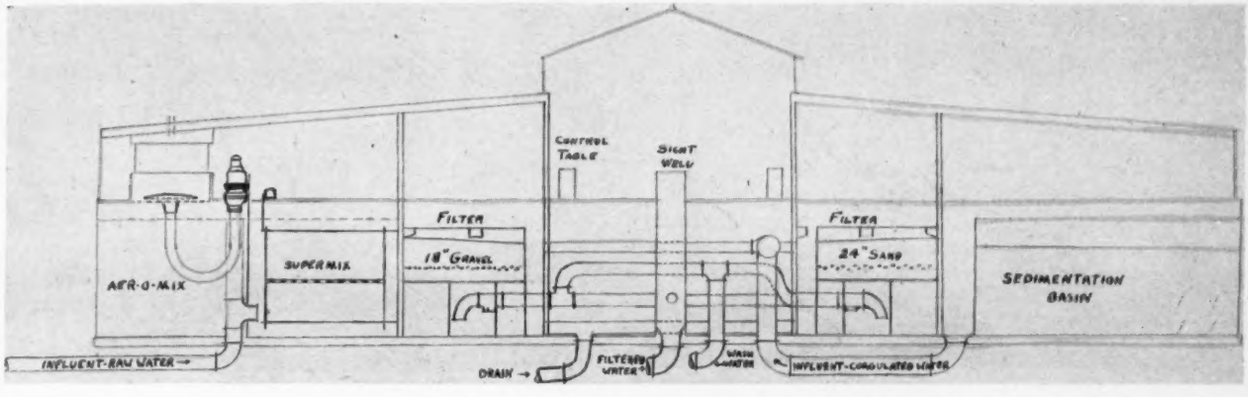
Beyond the junction of the clear well outlets the water passes through a Venturi tube and then to the distribution system. The Venturi indicator-recorder, located in the pump room, enables the operator to regulate the rate of filtration in accordance with the city demand. Another recording gauge shows the water level in the clear water tanks.

The Filters

The four sector-shaped filter units, located between the central well (above which is the operating floor) and the semi-annular coagulating basins, each have a sand surface area of 434 square feet. Eighteen inches of graded gravel and twenty-four inches of Cape May sand (effective size of .47 mm. and a uniformity coefficient of 1.70) are supported on a perforated steel plate, supported on a steel grating, to form a false bottom under the filters. This added perforated plate was installed with the idea that a more uniform distribution of wash water would result from the more restricted openings through the plate.

Cork Insulation

The filter plant structure is 118 feet in diameter and the interior surfaces above the operating floor level are covered with inch-and-a-half cork for insulation and preventing sweating. The same covering is used in the pump and chemical house, for its sound deadening and insulating value. The interior wall of the sight well and the interior of the aeration chamber are lined with white tile.



Sectional Sketch of Coagulating Basins, Aerators and Filters.

The sight well is equipped with an under water light and the bottom section around the outlet pipe is lined with alternate black and white tile, as illustrated.

Painting

All steel surfaces below the water level have been cleaned with mechanically operated wire brushes to remove rust and the surfaces have been painted with four coats of a Bakelite paint. The outside metal surfaces of the filter plant and the clear water tanks have been wire brushed and covered with three coats of gray enamel paint.

The filtered water storage, now available with the two clear wells at the filter plant in addition to a steel standpipe and a high service reservoir in the city, totals 1,572,000 gals. and this with the filtering capacity of the plant will meet all fire service requirements.

Wash Tanks

There are two wash water tanks. Each has a capacity of twenty-five thousand gallons and provides a head of twenty-seven feet above the wash water trough overflow line. Filtered water is pumped to the wash water tanks by two centrifugal pumps located in the pipe vault and automatically controlled by the water elevation in the tanks.

The pump and chemical house, three stories high, has a storage room for chemicals on the top floor. Four dry

Walkway Across Coagulating Basins and Annular Filters to Operating "Circle" with Tables Around Periphery and Filtered Water Sight Well at Center. Note Cork Ceiling and Sidewalls.

feed chemical machines are on the second floor. Chlorine equipment, now located in another building, is to be moved to this room. The laboratory is also on the second floor. The pump room on the first floor has space available for the future installation of Diesel engines and electric generators. Heating equipment, pumps and tanks for high pressure service water are located in the basement.

Initial Operating Results and Costs

Operations to date have shown that water with a color below five and practically no turbidity can be produced with not more than three-fourths of a grain of alum per gallon and a pH of 8.3 to 8.5 can be maintained in the filtered water with about one grain of lime per gallon.

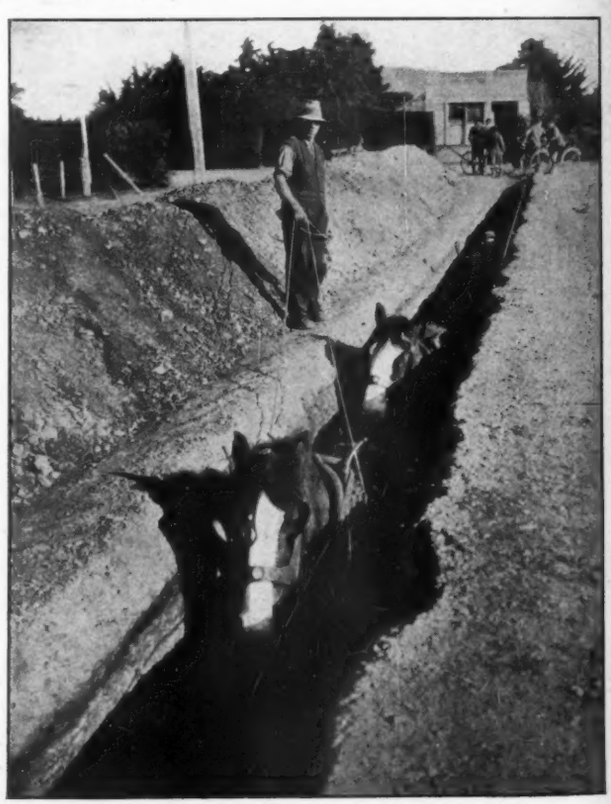
The contract price for the filter plant, pump and chemical house, and two clear water tanks was $152,000. The wash water settling basin, pipe lines between the plant and the distributing system, engineering and so forth, will bring the total cost to about $170,000, or $34,000 per million gallons capacity.

I wish to acknowledge at this time, my indebtedness to the representatives of the Chicago Bridge and Iron Company, general contractors. I am especially indebted to Messrs. Harry B. Shaw, A. A. Kenney, E. F. Humm and L. C. Stiles, all of whom have contributed to the solution of problems which have arisen.

▼

NOVEL "TWO HORSE" TRENCHERS ON WALL STREET PROJECT

This novel and interesting method of putting down sewer trenches has been developed in New Zealand. This particular project was in Wainmate's Wall Street and the trenchers had reached a depth of about 7 feet when this snapshot was made. The caption failed to say how the two horse "machine" worked out at 11 or 12 feet, or how the "trencher" worked in reverse. We now have "sheep's foot rollers" and "horse foot trenches"—only the first is a rank imitation. (Photograph by courtesy of Jack M. Diven.)



Two-Horse Trencher in 7-Ft. Cut

JUST as these fishermen are going over their nets and floats for greater efficiency and catch, water plant operators should adjust their treatment to compensate for Summer changes in their water supply.

Warm weather invariably promotes excessive algae and other organic growths in raw water supplies—resulting in increased tastes and odors, with its attendant difficulties in controlling. At this season there is also the increased need of water for drinking and other purposes.

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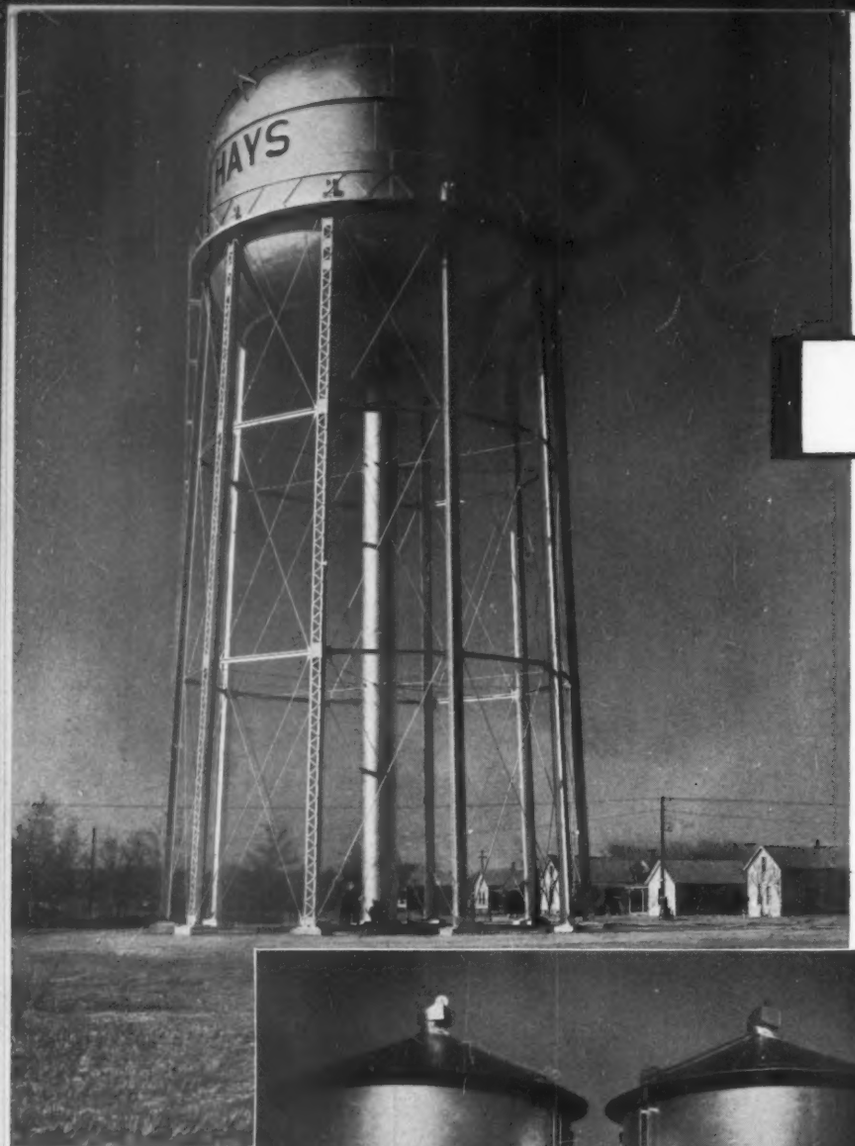

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CALIFORNIA SEWAGE WORKS ASSN.

Discusses Paints and Corrosion Prevention at San Diego

By A. M. RAWN
*Associate Editor**

STILL slightly jittery, as a result of many disturbances to sewerage systems and interruptions in service occasioned by the March floods, members of the California Sewage Works Association met in spring conference at the U. S. Grant Hotel, in San Diego, on April 11th and 12th, to discuss their difficulties and discuss current operation and maintenance problems.

The meeting began with an operators' discussion of plants to be visited in a caravan on the following day. Each of the operators directed attention to particular features of his plant which he felt were unique and meritorious. Then followed a symposium on "Experience With Paints" by three superintendents of California's largest plants. City Councilman John S. Siebert extended a welcome to the group at luncheon, commented briefly upon the benefits which were to be derived from the work being accomplished by the Association, and expressed the hope that its meeting in San Diego at this time would focus attention upon the city's need for better disposal facilities.

Senor Julio Davila, city engineer of Tijuana, Baja California, reviewed a sanitary problem existing in the Tijuana Valley, including United States and Mexican territory, and related how the situation had been met and solved through cooperation of engineers along the international border, without Federal intervention. The many Americans who visited Tijuana in its hey-day, when prohibition was in effect in the United States, and gambling was permitted in Mexico, will remember that city as comprising streets of gayly painted shacks equipped with bars and gaming tables, dance halls and the like, and filled with exuberant, slightly intoxicated fellow citizens. Following the repeal of prohibition in the United States and President Cardenas' ban on gambling in Mexico, Tijuana soon became a sordid, tawdry, sprawling, unsanitary Mexican village with a population largely unemployed. Help for the idle was fortunately thought of in terms of the construction of adequate sanitary facilities. These, in turn, led to mutual cooperation between the city engineers of the two countries; and Senor Davila related how, with the assistance of the health authorities of the State of California and the city engineers of the small towns lying south of San Diego, sewerage betterments for the entire area were planned and constructed to the advantage of both countries. Davila extended his gratitude to the American engineers residing near the Mexican border, many of whom were present, and concluded his remarks by assuring those present that in the hearts of Mexicans was a profound regard for the United States of America and its citizens, and a wish for continued friendship.

Laguna Beach's "Plant Beautiful." (All Air Leaving This Plant Receives a Chlorine Gargle to Keep the Neighbors Happy—Yes, It's a Sewage Plant.)

The afternoon technical session was devoted to discussion of corrosion, a metal spraying process, and an illustrated narrative account of the Ward's Island treatment plant—the latter being a joint presentation by C. G. Gillespie, Chief Engr., of California Dept. of Health and C. C. Kennedy, San Francisco Consulting Engineer. Messrs. Gillespie and Kennedy supplemented one another's remarks, painting a general picture of the magnitude of the Ward's Island (N. Y.) treatment plant and its processes. Obviously the Ward's Island works is the "Grand Coulee" of all sewage treatment plants, until Chicago's largest plant goes into commission.

As guest speaker at the dinner meeting, Colonel Ed Fletcher, State Senator from San Diego County, traced the history of water development in and about San Diego and reiterated the hope of Councilman Siebert that this meeting of the Association would assist in remedying the inadequate sewage disposal facilities of the city.

Tuesday morning a trip over the harbor under the guidance of Director of Public Utilities Rhoades and Assistant City Engineer Phelps, acquainted members with San Diego's prospective sewerage plans and its immediate problem of sewage disposal.

At noon the motor caravan started north along the coast highway, met at Oceanside for luncheon, listened to a brief talk by Frank W. Herring, Executive Director, American Public Works Association. and proceeded to an inspection of new sewage plants at Laguna Beach. Newport Beach, Huntington Beach and finally Seal Beach, where the group dispersed.

*Asst. Chief Engr., Los Angeles County Sanitation Districts, Los Angeles.

A Bunch from the North

From Stockton—Fred West, Supt. of Sewerage; From Lodi—Fred Post, Another Super.; W. T. Ingram, San Joaquin County's Handsome Sanitary Engr., and James Parr, Manteca's Chief Operator.

(1) The City Engr. of Tiajuana, Mexico, and B. D. Phelps, Asst. City Engr., San Diego; (2) Frank W. Herring, Exec. Director, Amer. Pub. Wks. Assn., Chicago, with Winston Updegraff, Editor, "Western City" Magazine (Birds of a Feather); (3) John J. Seibert, City Councilman, San Diego; (4) John D. McMillan, Super. of Newport Beach's Modern Stream-Lined Plant (See Picture), and "Bob" Patterson, Newport Beach's City Engr. and Pioneering Odor Controller; (5) W. T. Knowlton, Veteran Sanitary Engr., Los Angeles Bureau Sewers, with C. G. Gillespie, California's Chief Sanitary Engineer. How Come the Top-Coat in Southern Cal., Chet?

Technical Sessions

"Operation of the Laguna Beach Plant to Control Odors," by R. D. WOODWARD, Plant Operator and Mechanic, Laguna Beach.

This plant, located within a stone's throw of the business district of Laguna Beach, makes use of the acticated sludge process. Sewage flows from a primary clarifier through the aeration tanks to two secondary clarifiers. Sludge is digested and gas is at present burned to waste. To meet beach resort requirements the designed capacity of the plant is 720,000 gallons per day; whereas, the average daily flow is but 95,000 gallons.

In order to control odors, exhaust air from the covered subsidence and aeration tanks is vented through a 20-inch pipe to a ventilation tower placed on the hillside behind the plant. Air is blown through sixteen sprays of chlorinated water and up the stack. The system has worked exceedingly well and odor complaints are negligible. Mr. Woodward mentioned minor difficulties which were encountered in getting operation under way, but stated that in general the works were producing end results in keeping with design predictions.

"Operation of Huntington Beach Plant to Control Oil," by JOHN C. CLARK, Chief Operator, Huntington Beach.

Mr. Clark, whose plant was put entirely out of commission by the Southern California flood of March 2, burn the oil. Unfortunately for Mr. Clark the flood of March 2nd occurred just when he was ready to put his new scheme into operation, and he was unable to report upon the success or failure of the scheme.

Experiences with Paints

"Experiences with Paint" were contributions of J. H. VAN NORMAN, Chief Operator, Hyperion Plant, Los Angeles; Carl F. Tennant, Superintendent, Los Angeles County Sanitation Districts Plant; Joseph Corrao, Superintendent of Pumping Plants, City of San Francisco.

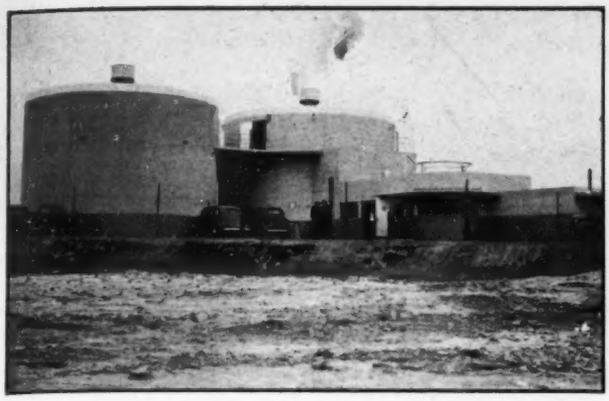
Mr. Van Norman, after describing experiences with various types of paint at the Hyperion screening plant, where sulphide sewage gases are extremely abundant because of the septic condition in which sewage reaches the plant, advanced the opinion that coal-tar paints, properly applied, were preferable to any other for the protection of metals. He showed a sample of 3/16-inch steel plate taken from a screenings elevator which, while almost completely destroyed in spots, was perfectly sound wherever the coal-tar base paint had adhered to the metal.

MR. TENNANT, the second speaker, cautioned operators against the indiscriminate use of paints which, applicable in one location, might be totally inadequate under other conditions. Linseed oil, as an example, assumed a yellow shade if used for inside work, while maintaining its clear color on outside exposure. Dis-

(1) "Judge" Ray Goudey (Los Angeles), President of the Association, and Colonel H. S. Smith, Sewerage Engineer, Los Angeles; (2) R. D. Woodward, Plant Supt., Laguna Beach, and J. C. Clark, Plant Supt., Huntington Beach; (3) Richard Pomeroy, No. 1 Research Chemist, Los Angeles County Sanitation Districts; (4) C. F. Tennant, Supt. Joint Disposal Plant, Los Angeles County Distr., and J. H. Van Norman, Supt. Hyperion Plant, Los Angeles City; (5) C.S.W.A.'s "Mutt and Jeff"—Otherwise John Skinner, Los Angeles Consulting Engr., and F. A. Batty, Maintenance Engr., Los Angeles Bureau of Sewers.

related that his principal difficulty was the handling of crude oil which found its way to the city sewers. Huntington Beach is a veriable forest of oil derricks and in spite of the best efforts of city officials, oil finds its way into the sewers and the separate sludge digestion-trickling-filter plant suffers accordingly. In an attempt to cure the situation and dispose of the oil, an underdrained pit had been constructed—(3 ft. by 9 ft. in plan and 2 ft. deep)—in the bottom of which was placed one foot of No. 2 rock covered with a layer of sharp sand. The idea was to drain the oil from the sewage to the pit, permit the water to drain off and then attempt to

cussing white paints with zinc oxide bases, Mr. Tennant stated that in most instances the zinc oxide contains small amounts of lead carbonate which tend to blacken in the presence of hydrogen sulphide. The zinc oxide base paints would, however, discolor much more slowly than the pure lead base. Quoting from his paper, descriptive of aluminum paint and its application: "The pigment is not a powder at all but tiny flakes or leaves. When applied, these flakes adjust themselves in a compact scale formation, essentially presenting an aluminum sheet to the weather." He boosted aluminum paints, but cautioned operators to



Newport Beach's "Plant Moderne." (Emerged from Its Mud-Bath in the Recent Flood More Modern and Spick Than Ever.)

closely follow the manufacturer's specifications, lest there be an overcrowding of aluminum flakes. Also, unless the vehicle was the proper one the powder loses its buoyancy and produces an inferior coating.

MR. CORRAO, through experience, had come to the conclusions, that, bituminous base paints on clean, dry concrete surfaces are most successful; that, the action of sewage upon *submerged* metals is not as severe as might be expected, and paints used as protection in this instance should be especially adapted to resisting abrasion perhaps more than corrosion; that, for painting iron and steel surfaces, exposed to an atmosphere containing measurable amounts of sewage gases, preference went to machinery enamels composed of the best types of synthetic resins, applied to clean, dry metal. In this protection the primer coat should not be too thin and should be permitted to dry completely before subsequent coats were laid on. Mr. Corrao had found aluminum paints unsatisfactory, in that they lost their brilliancy and became dark gray in appearance. He did not comment upon their efficiency as protective coatings. In his final conclusion, Mr. Corrao called attention to the necessity for complete removal of mill scale from all metal surfaces by sand or shot blasting prior to painting.

Corrosion of Sewerage Equipment

"Electrolytic Corrosion," by RICHARD POMEROY, Research Chemist, Los Angeles County Sanitation Districts.

Mr. Pomeroy stated that the types of corrosion of importance in sewage treatment are those which occur in the presence of sulfides. If sulfides are present, a sulfide of the metal will be formed when corrosion occurs. Such did not hold in the case of aluminum, which explained its resistance to tarnish and corrosion at sewage works. Sulfides are not oxidizing agents; hence, in order for sulfide corrosion to occur, either oxygen must be present, or hydrogen gas must be evolved.

Discussing corrosion in the sludge digestion tanks of a California plant, Mr. Pomeroy explained that the plant is built on sandy soil, with salt water a short distance below the ground surface. The sewage itself contains some salt water; thus, both sewage and soil have good conductivity. Pipes and conduits laid in such soil serve as cathodes, while structures in the sludge digester, become the anodes of an electric circuit. Certain manhole steps submerged in the sludge were nearly destroyed in fifteen months. This is in marked contrast to the usual behavior of iron, which is practically immune to corrosion if immersed in sludge under conditions which do not permit this sort of chemical battery effect and electrolysis.

Another type of electrolysis, Mr. Pomeroy explained, is that which results when two submerged metals are electrically connected. Generally the more corrodable metal will have its corrosion rate increased, while the nobler metal will corrode less than if alone. Serious corrosion has been reported in the case of centrifugal sewage pumps employing ill-chosen combinations of metals for impellers and seal rings.

Corrosion from electrolysis due to differences in the concentration of the oxidizing agent may be retarded by coatings, but such coatings are effective only on the cathode areas which carry the positive (+) charge.

Corrosion arising from the contact of different metals may best be avoided by the proper choice of metals—namely, those which are most nearly alike in respect to their position in the electrometric series.

Stray current electrolysis may be diminished by coatings at the places where the current gets onto the pipe but it is generally more effective to drain the current from the pipe. Cathodic protection of pipe and metal structures is a modern method, entailing reversion of the electrolysis effect, in which current leaves the pipe at spots to cause external pitting.

"Metalizing with Coatings of Non-Corroding Metals," by L. E. KUNKLER, President, Metalizing Company of America.

Mr. Kunkler described the ingenious process of applying hot sprayed metals. The equipment, he stated, was a small gun embodying a miniature power plant and foundry—the power plant being an air operated high-pressure turbine and the foundry, a gas-flame nozzle similar to a cutting torch. The desired coating metal is fed to the "foundry" in wire form continuously. Raised to a temperature of 6,000 deg. F. the molten wire flows into the air stream to be sprayed onto the surface to be protected or built up. The gun will spray any metal, the difference in melting points being compensated for by differences in rate of feeding metal into the hot nozzle. Thus, lead may be applied at the rate of 100 lbs. per hour while high carbon steel may be similarly applied at only 9 lbs. per hour. As a tool for salvage of worn or damaged parts, with lowering of maintenance costs as well as for improving products, this process has found considerable use in industry. Mr. Kunkler cited a number of plants where metalizing has been used to advantage in building up shafts, impellers, armature shafts and the like, by coating with bronze or stainless steel as the occasion required. He quoted from tests made in Manchester, England, in which it was stated that sprayed metal possessed a decided advantage as a bearing journal, and like use, because of its oil-absorbing qualities. The speaker did not discuss at length the matter of corrosion-prevention from the use of applied metal, but merely called attention to the fact that certain metals which could be sprayed were corrosion-resistant and, if properly applied, might be used in refinishing corroded parts or protecting new parts. It was not difficult for his audience to envision the application of the metallizing process in water works and sewerage maintenance and repair work.

AN EXPERIMENT IN PUBLIC RELATIONS

Otherwise, Special Sprinkling Rates on the 3 for 1 Saving Plan

By G. WEBBER KNIGHT
General Manager, Natrona Water Company, Natrona, Penna.

The authors of this article, prepared at the request of WATER WORKS AND SEWERAGE *and offered as "an experience" of a privately owned water company testing the practicability of special summer sprinkling rates, has the distinction of being President of the Penna. Water Works Operators Assn.—Ed.*

The Author

EARLY in the summer of 1936, which turned out to be a hot and a dry summer, numerous requests were received from customers of the Natrona Water Company that some plan should be devised whereby additional water could be available for sprinkling and care of lawns, the growing of gardens, and other extraordinary household uses, without the cost being prohibitive. Some customers held the opinion that the regular rates in effect were too high to use additional water for the above mentioned uses.

In a spirit of cooperation, and admittedly as an experiment, we worked out a plan whereby domestic consumers using water in excess during the hot weather season would receive three thousand gallons of water for the price of one. That is to say, the reduced rates started with all water used over and above the quantity paid for by the customer during the same period of 1935, and the latter amount was taken as the base amount and referred to as "the base." In our schedule of rates, the minimum charge is on the basis of 8,000 gallons per quarter, and "the base" could automatically be no less than such a minimum. This plan was then offered as the new "3-FOR-1 PLAN." While the plan was intended primarily to enable and benefit those who desire to use additional water for the sprinkling and care of lawns and the growing of gardens, its use was not in any way restricted, and could be used for any and all household uses.

Introduction of Plan

To introduce the plan, dodgers were printed (see Exhibit "A"), and one was mailed to each customer and handed out in the office. An advertisement was run in the local newspaper using the same copy as shown on the dodger. The local newspaper also wrote a news story and played up the plan. A series of six cooperative advertisements was run by two hardware and plumbing stores, stressing the plan, and advertising sprinklers, water hose, plumbing supplies, and the like. The scheme began to look like "Big Business."

The Offer

(In addition to the illustrated dodger we are reproducing the complete wording (offer) in type, so that the plan and its explanation, through question and answers, may be more easily read.—Ed.)

NATRONA WATER CO.
OFFERS A NEW PLAN FOR
SAVINGS

for domestic consumers for the third quarter of 1936, whereby each customer will receive 3 thousand gallons of water for the

NATRONA WATER CO.

OFFERS
A NEW PLAN FOR

SAVINGS

for domestic consumers for the third quarter of 1936, whereby each customer will receive 3 thousand gallons of water for the price of one for all water used over and above the quantity used during the same period of 1935.

While the plan is intended primarily to enable and benefit those who desire to use additional water for the sprinkling and care of lawns, and the growing of gardens, its use is not in any way restricted, and can be used for any and all household uses.

HERE IS THE PLAN—

(1) Refer to your water statement for the third quarter of 1935, and obtain the amount of water for which you were billed during the period, which we shall call the base amount or the base. This base cannot be less than 8 thousand gallons.

(2) For all water used over the base amount you pay for the first thousand gallons and the next two thousand will be supplied without additional charge. You again pay for the fourth thousand over the base and the 5th and 6th thousand will be supplied without additional charge and so on, regardless of the amount used for domestic use.

Questions and Answers:

Question 1.—What must I do to participate in the plan?
(Answer)—Just use the water service.

Question 2.—If I used 10 thousand gallons in the third quarter of 1935 and in the third quarter of 1936 I used 19 thousand gallons, how much would I be billed?
(Answer)—You would be billed for 13 thousand gallons. Inasmuch as your base is 10 Thousand gallons you would pay for the 11th thousand gallons with no additional charge for the 12th and 13th thousand gallons, you would again pay for the 14th thousand gallons and receive without additional charge the 15th and 16th thousand gallons, also you would pay for the 17th thousand gallons and receive without additional charge the 18th and 19th thousand gallons. In other words, you pay for the base of 10 thousand plus the 11th, 14th, 17th thousand gallons and the remainder of six thousand gallons you receive without additional charge.

Question 3.—If I used 9 thousand gallons in the 3rd quarter of 1935, and in the third quarter of 1936, I used 14 thousand gallons, how much would I be billed?
(Answer)You would be billed for 11 thousand gallons. You would pay the base of 8 thousand gallons, plus the 10th and 13th thousand gallons and receive the 11th, 12th and 14th thousands gallons without additional charge.

Question 4.—When shall the above plan take effect and for how long?
(Answer)—The above plan will be in effect only for the third quarter of 1936, and is in effect from your meter reading date in July, 1936, up to your meter reading date in October, 1936.

Question 5.—What is the purpose of the plan?
(Answer)—The purpose of the plan is to supply our customers with water service at an exceedingly low rate for additional water they would like to use during the late summer months for the care of lawn, growing of vegetable and flower gardens, and many similar summer domestic needs.

Question 6.—Suppose the statement for the third quarter of 1935 is mislaid or destroyed. how will I find out my base amount?
(Answer)—Just phone, write or call at our business office and the information can be supplied you.

IMPORTANT:

FIRST—Remember that the above plan is in effect only for the third quarter of 1936, namely, for July 1936 meter reading date, to October 1936 meter reading date.

SECOND—It is not necessary to call us in order to participate in the plan. Simply use the water, and you will be billed in October, 1936, on this new plan.

THIRD—This plan applies only to water service to domestic consumers.

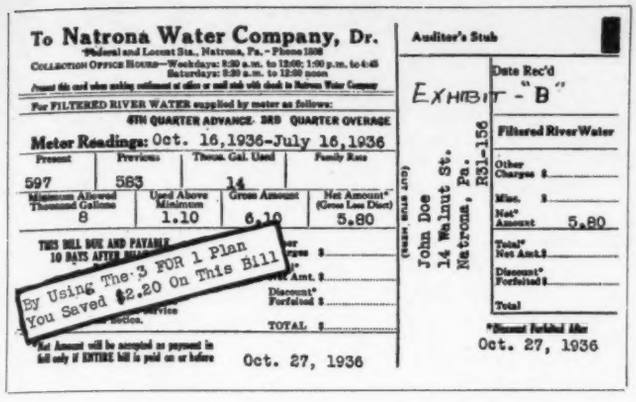
FOURTH—For any additional information, call at our business office or 'phone Tarentum 1606.

NATRONA WATER CO.

G. WEBBER KNIGHT, MANAGER

"ENJOY and IMPROVE Your Daily Living with the new 3-for-1 plan"

Exhibit "A"—The Hand-Bill Announcing the "3-for-1 Plan" Offered Water Consumers."


To Natrona Water Company, Dr.

Federal and Locust Sts., Natrona, Pa. - Phone 1508

COLLECTION OFFICE HOURS—Weekdays: 8:30 a.m. to 12:00; 1:00 p.m. to 4:45
Saturdays: 8:30 a.m. to 12:00 noon

Present this card when making settlement at office or mail stub with check to Natrona Water Company

For FILTERED RIVER WATER supplied by meter as follows:

4TH QUARTER ADVANCE 3RD QUARTER OVERAGE

Meter Readings: Oct. 16,1936-July 16,1936

Present	Previous	Thous. Gal. Used	Family Rate
597	583	14	

Minimum Allowed Thousand Gallons	Used Above Minimum	Gross Amount	Net Amount* (Gross Less Disc)
8	1.10	6.10	5.80

THIS BILL DUE AND PAYABLE 10 DAYS AFTER READING

By Using The 3 FOR 1 Plan You Saved $2.20 On This Bill

Net Amt. $

Discount* Forfeited $

TOTAL $

*Net Amount will be accepted as payment in full only if ENTIRE bill is paid on or before Oct. 27, 1936

Auditor's Stub

EXHIBIT - "B"

Date Rec'd

John Doe
14 Walnut St.
Natrona, Pa.
R31-156

Filtered River Water

Other Charges $

Misc. $

Net* Amount 5.80

Total* Net Amt.$

Discount* Forfeited $

Total

*Discount Forfeited After Oct. 27, 1936

Exhibit "B"—Specimen of Quarter Bill-Card in 3-for-1 Plan. Note the 6,000 Gals. Used Above the "Base" of 8,000 Gals. Of This, the Customer Paid for Only 2,000 Gals. at the Regular Metered Rate. And, John Doe Is Reminded of Water Valued at $2.20, for Which He Has Not Been Charged. However, the Extra $1.10 Which the Customer Did Pay, Added Something to the Net Income of the Water Utility.

price of one for all water used over and above the quantity used during the same period of 1935.

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FOURTH—For any additional information, call at our business office or 'phone Tarentum 1508.

NATRONA WATER CO.
G. Webber Knight, Manager
"Enjoy and Improve Your Daily Living with the new 3-for-1 plan."

Results of the Scheme

In the best residential section, 29.7 per cent of the customers participated in the plan, while the average of all our customers was only 17.6 per cent. Comparing the third quarter of 1936 to the third quarter of 1935, the total consumption increased by 16 per cent, while the revenue increased only 2.6 per cent. For the participating accounts, the ratio of excess total consumption (above the "base") to the total paid for was actually 2½ to 1, rather than the possible 3 to 1. The direct expense including dodgers, advertising, mailing, and water cost amounted to 71.5 per cent of the additional revenue received. In billing, a small pink sticker was placed on the bill card (see Exhibit "B"), which emphasized, for benefit of the customer, his actual saving by participating in the special reduced rate plan.

Advantages of the Plan

(1) Our "3-FOR-1 Plan" satisfied a request on the part of the customers for lower rates for water service in order that they might more freely use water for lawn, garden, and other extraordinary household uses.

(2) It enabled customers to use additional water for extraordinary needs at low cost; and, actually saved many some money, at the same time providing slight net revenue increase to the water utility.

(3) It reduced complaints that water rates were too high for lawn, garden, and extraordinary household uses; and, without question made some friends for the company.

Disadvantages of the Scheme

(1) The special rate is discriminatory. It often happens neighbors compare bills. Assuming customer A used 8,000 gallons during the third quarter of 1935, and customer B used 14,000 gallons during the same period, and both used 14,000 gallons during the third quarter of 1936, customer A would be billed for 10,000 gallons while customer B, with the same consumption, would be billed for the full 14,000 gallons.

(2) The customer who paid the larger bills throughout the year did not get the advantages that the previously careful, if not penurious, user could receive. It appears that the customers who have paid the larger bills should receive more benefits from any plan, than should the customer who has paid a minimum or low bill in previous years.

(3) It is the policy of the Company to estimate the reading at the minimum of 8,000 gallons, when the meter reader cannot obtain admittance to read the meter. In as much as the "base" was defined as the consumption of the third quarter of 1935, where such minimum billing was resulted it had to be taken as the "base," and some received, thereby, benefits to which they were not entitled.

(4) On all new accounts, the base used was 8,000 gallons, because there was no consumption on record for the third quarter of 1935. In many cases, the average consumption was much higher than the minimum, and

again new customers gained an advantage that old customers did not receive.

(5) The billing and accounting process is too complicated to be practical. When each account is billed, reference must be made to the previous year's consumption to determine the base in making up the bill and computing the net saving. The bill of each customer must be separately calculated because, though the consumption for different customers may be the same the amount of the bill may vary considerably, as the cases cited have indicated.

(6) A number of complaints were actually received, where like consumption was billed at different prices, due to differences in the "base" employed.

(7) Only 17.6 per cent of the total number of customers participated in the plan. Such a low percentage appears to be too small for the plan to be considered of practical dimensions as a continued scheme.

Conclusions Reached

In 1937 the plan was not re-offered because it appears that the disadvantages outweigh the advantages. It was primarily introduced to meet the requests of a minority of customers, and to build better customer relations. As a whole it is doubtful if it did create overall better customer relations, and the fact that only 17.6 per cent benefited by the plan, did not appear sufficient to warrant its continuance. Perhaps more advertising and publicity was needed but, in our opinion, if the scheme had been a good one, with the introduction it had, it should have carried itself along by evidence of a greater number of consumers benefiting.

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WATER WORKS OWNERSHIP IN THE UNITED STATES

(A Review)

"Water Works Ownership in the United States" is a highly interesting and enlightening booklet published by Burns & McDonnell, Consulting Engineers, Kansas City, Mo. It is a presentation of nation-wide statistics revealing the significance of municipal ownership of public utilities—water works in particular. Based on returns from a survey of all United States cities of more than 3000 population, a list reveals the number of such cities, grouped by states, which own their water works, as compared to those privately owned. The discussion is then directed to "Why Every City Should Own Its Water Works" and points to the growing trend in the direction of cities taking over private utility properties, and the advantages therefrom. The thesis then points to the record low debit interest rates now available to municipalities; and, what these mean in permissive water rate differences between a municipally financed and privately financed water utility. Such argument is supported, too, by a compilation of water rates being charged under the two types of operation. Under the heading "As a Matter of Fact" are citations of the earnings and surplus of city-owned water works which have been put to better use at home than when turned over to "foreigners," representing stockholders in the usual privately owned water company. To read the story, "Water Works Ownership in the United States," is to be convinced of the soundness of principle of municipal ownership—minus politics, we might add.

Water Works and Sewerage—June, 1938

W. M. PIATT—DOCTOR OF ENGINEERING

Honored by his Adopted State—North Carolina

Wm. M. Piatt

William M. Piatt, well known, widely admired, successful Consulting Engineer of Durham, N. C., has been signally and appropriately honored by North Carolina — his adopted state. Word has been received that North Carolina State College, at its recent commencement exercises, honored Mr. Piatt by bestowing on him the honorary degree — Doctor of Engineering.

A native of Pennsylvania, "Bill" Piatt went down to North Carolina on a job—liked the state and the folks, settled there in 1899. Since then he has become well known as one of America's most successful consulting and designing engineers, with many important sanitary and hydraulic engineering projects to his credit. Nowhere are such more appreciated than in his home city of Durham. He has also been honored by his *alma-mater,* when Lafayette College bestowed upon him an honorary Master of Science degree. And, in North Carolina, he was only a year ago made the recipient of a citation by the N. C. Engineering Society for "outstanding services to the state as an engineer." In admiration of the man, as well as the engineer, we say that "Bill" Piatt deserves all of this.

▼

RICE ELECTED SECRETARY-TREASURER S. E. SECTION

B. P. Rice

At the business meeting of the Southeastern Section of A.W.W.A., held during the recent New Orleans Convention, B. P. Rice, Chief Engineer, South Carolina Department of Health, Columbia, S. C., was elected Secretary-Treasurer to succeed W. H. Weir, resigned.

"Bill" Weir, who had long served the Southeastern Section in this important office, asked to be relieved. He was given a special vote of appreciation for this and other services rendered the Section, and A.W.W.A. In selecting Mr. Rice, the Southeasterners have chosen another live wire "wheel-horse," to pull the important secretarial load.

▼

HYDRAULIC TABLES—This is a booklet (7¼ x 4¾ in.) of 36 pages of tables of hydraulics data, formulae, conversion factors and graphs published by the Inspection Department of Associated Factory Mutual Fire Insurance Companies. Its contents include "Hydrant Discharge Testing" (with formula); Nozzle Discharge Tables; Tables of Theoretical Discharge Through Orifices; Conversion Tables (head of water to pressure and the reverse); Effective Reach of Fire Streams (with various pressures and nozzle sizes); Properties of Numbers (fractions to decimals, square roots and cube roots of numbers, areas of circles). The price being charged for "Hydraulic Tables" is 25 cents. Address Associated Factory Mutual Insurance Cos. (Inspection Dept.), 184 High St., Boston.

MARYLAND-DELAWARE WATER & SEWAGE ASSN. HOLDS ITS BEST MEETING

Excellence of Program Brings Record Attendance

ELEVEN years ago the organization meeting of the Maryland-Delaware Water and Sewage Works Association took place in Baltimore, Md., with a handful of operators in attendance. This year, returning to Baltimore for its 12th Annual Conference, May 19 and 20, the Association, now boasting a membership of 209, registered an attendance of better than 200 members and guests.

In keeping with the times, it was found that the Md.-Del. Association had recorded an all-time high in registered attendance. More important still, was the interest manifest in an excellently proportioned program, evidenced by the attendance at the various sessions. The annual dinner-dance and floor-show, well above the average quality, attracted 180 members and guests to hear appropriately brief speeches by Maryland's Commissioner of Health and Chief Engineer, and representatives of Governor Nice and the Mayor of Baltimore. The music was splendid and, all in all, the evening was highly enjoyable.

Business Meeting

In a brief business-session, Secretary-Treasurer Blohm reported a gratifying gain of 29 new members during the year and but one resignation. With a bank balance of $717 on hand, and a record membership of 209, the report of the Secretary-Treasurer was pleasantly received.

The following officers were unanimously declared elected for the year:

President—Chas. J. Bruce,* Supt. Water, Cumberland, Md.

Vice-Pres.—A. M. Tawney, Supt. Filtration, Fort Meade, Md.

Vice-Pres.—G. E. Harrington, Asst. Supt. Filtr., Washington, D. C.

Secy.-Treas.—A. W. Blohm, Md. Dept. of Health, Baltimore, Md.

Executive Committee—E. C. Cromwell (Baltimore) and E. St. Clair Maxwell (Frederick), as members at large to serve with the officers.

CARL A. HECHMER, Chairman of the Short Course Committee, reported on the success of the second course given at the Univ. of Maryland, and sponsored by the Association, the State Dept. of Health and the American Water Works Assn. (The third three-day Short School is scheduled for September 12-14, at the University of Maryland in College Park, Md.—the fee being $7.00 including rooms and meals at the University; or, for non-residents only $3.00. Chairman Hechmer has worked up a splendid program which may be had by addressing him, care of Washington Suburban Sanitary District, Hyattsville, Md.—Ed.)

*The new president, with a plant located in Pennsylvania but serving water in Maryland, is a unique situation. He finds himself torn between "two loves," for he is also serving as Vice-President of the Pennsylvania Water Operators Assn.—Ed.

Retiring President
Edw. S. Hopkins, Baltimore
(Raised to Filtration Engr. During the Conference.)

Incoming President
Chas. J. Bruce, Cumberland
(And, Slated for the Same Job in Pennsylvania.)

Vice Pres. — Secy.-Treas. — 2nd Vice Pres.

A. M. Tawney, Supt. Filtration, Ft. Meade, Md.; A. W. Blohm, Asst. Engr. State Dept. of Health, Baltimore; G. E. Harrington, Chemist, Filter Plant, Washington.

Technical Sessions

(Edw. S. Hopkins, Presiding)

The president introduced his boss, Bernard L. Crozier, Chief Engineer of the City of Baltimore, who, after appropriate comments on the value of the Association to Maryland and Delaware municipalities, used the opportunity to say a few nice things about the personnel of the Baltimore Water Department and announce the elevation of Mr. Hopkins to the position of Filtration Engineer, left vacant since the retirement of Jas. W. Armstrong. Thus, Mr. Crozier said, competency had been rewarded not alone by elevation of position but also by the deserved salary increase to Mr. Hopkins, which he had gotten approved to take effect immediately. For a blushing president May 19 proved a real red-letter day.

The Stream Pollution Problem

To present a picture of "The Stream Pollution Problem in America" came Dr. Abel Wolman, of Johns Hopkins University (the first president of the Association), in the role of Chairman of the important Water Resources Committee of the Federal Government, and as Chief Engineer of the Maryland Dept. of Health. In his usual easy to follow style, he revealed that today 72,000,000 people in America are now served by sewerage systems; 36,000,000 of which are being served by 3,700 municipal sewage treatment plants as compared to only 19,000,000 so served 5 years ago. He pointed to a much less satisfactory advance in curtailing industrial pollution—the pressing problem for the immediate future.

In discussing the political, legal and financial phases of regional stream pollution regulation Mr. Wolman, stating a new technic in management and financing was required, and cited the Potomac River Conservancy District as a test demonstration to determine what may be accom-

(1) J. T. Basil, Pres. Annapolis Water Co., and Edgar Donaldson, Plant Supt.; (2) Ed. Schneider, Kennedy Valve Co., and Carl Hechmer, Dept. Engr., Washington Suburban Sanitary Distr. (Short School Chairman); (3) Miss Gipe, Maryland Dept. of Health (Has Served All Twelve Conferences as Recording Secretary), and the Secy.-Treas. A. W. Blohm; (4) Ralph Fuhrman, Asst. Supt., and Edw. Johnson, Supt. Sewage Treatment Works, Washington, D. C.; (5) I. S. Kefauver, Supt. Filtration, and A. H. Culler, Supt. Sewage Treatment, Frederick, Md.

plished in the way of regional control without aid of special law. It had been estimated by survey that as much as $25,000,000 would be the expense involved in cleaning up the Potomac and its tributaries. Another experiment was to be found in the efforts of the Delaware River Commission, representing four states but having no real powers other than arousing public demand for a cleaner Delaware River. Still another was the test under way in the Merrimac River Valley, largely an inter-city problem.

The most difficult test was that to be applied to the Ohio River Basin. Studies, jointly by the U. S. Public Health Service with U. S. Army Engineers, were to begin in 60 days and run over a period of 2 to 3 years. Five months ago the Ohio River's Board had been set up by the President to report on flood and pollution control schemes. Involved were 85 to 90 control reservoirs, and pollution curtailment requiring a $150,000,000 expenditure, without doing much in the way of treating industrial wastes. If the test proved successful technically, a miracle in Sanitary Engineering will have been created, because of the complexity of the problem and the great area of the region affected.

Concerning Federal legislation directed at stream pollution, an impasse had been reached since the Lonergan-Barkley bill of the Senate remained in the hands of the Conference Committee because of objections to parts which, while offering Federal financial aid, likewise called for Federal jurisdiction sufficiently objectionable to hold up its passage. It was the constant hope, however, that the differences in the Vinson bill, which has passed the House, and the Senate bill could be reconciled before adjournment of this Congress. Mr. Wolman made a plea that municipalities and states argue less, as to objections to the autonomy of Federal control in pollution abatement, and take some steps which will demonstrate the non-necessity of some such control.

"Baltimore's New Water Supply Tunnel," by LEON SMALL, Water Engineer, Baltimore, Md.

Mr. Small by aid of interesting lantern slides reviewed the design features and construction experiences on the new Gunpowder-Montebello Tunnel, delivering raw water to the Montebello Filters and supplementing the 57 year old tunnel. The new tunnel, 12 ft. in diameter and 7 miles long, is operated under pressure, some sections being mass concrete and others ½ inch steel plate backed with grout and cement lined. The section of conduit in open cut consists of 10 ft. diameter, 40 ft. long, welded steel tubes, encased in concrete jacket and lined with coal-tar enamel. An interesting feature of blasting was the use of delayed fuses (in eight steps) to take out sections in a pre-determined sequence to secure maximum fall and smoothest possible walls. Unique equipment was the mucking shovel and conveyor belt and the readily portable California Track Switch developed by the contractors to facilitate car handling. To dewater the tunnel, pumps at ground elevation supply high pressure water (575 ft. head) to operate specially designed 24-inch S. & K. eductors. The flow returned by the pumps to operate the eductors is one-half of the total volume of discharge to the surface at the rate of 10 m.g.d.—i.e., 5 m.g.d. pumped to lift 5 m.g.d. by the eductors.

Asked why deep well pumps would not be the more logical dewatering units, Mr. Small replied that the eductor operating cost would not be of importance because of the infrequency of dewatering. More important, the eductors would not suffer from standing idle. Because of their reliability, shut-off valves of automatic cone design had been used on the pumps—the four costing $5,500 each—was the answer to another query.

"Sewer Construction Methods to Preclude Infiltration," by WILLIAM A. GOFF, Consulting Engineer, Philadelphia, Pa.

Mr. Goff's paper, presented by George A. Geiske, an associate, discussed the importance of reducing infiltration through sewer joints, from the standpoint of costs of treatment and pumping, sewer surcharging and sand entry. Describing the several most common methods of jointing sewer pipes and their practicability, Mr. Goff expressed his preference, based on experience, for the bituminous joint pre-formed or hot-poured. He referred to copper gaskets as root stopping devices, but his experience with properly hot-poured bituminous joints, covered with cement mortar, had shown these to be both infiltration and root proof. He recommended joints be made up with 1 inch depth of oakum followed by 1½ in. of hot-poured bituminous compound *in a dry trench.* As further protection a stiff cement-sand mortar (1:2) is placed by hand around the bell (especially the bottom) to fill possible voids left in pouring. A strip of muslin is then lapped around and tied in place to create a cement filet, serving as further protection and insuring water tightness.

Mr. Goff pointed out the great advantage in using well points to provide a dry trench. Contractors had found the favored joint uncumbersome to make and the use of well points to be to the distinct advantage of all concerned. Since the use of the cement mortar filet was

F. H. Dryden, Dist. W. P. A. Engr., Philadelphia; B. L. Crozier, Chief Engr. of Baltimore; W. J. Edwards, Water Commissioner, Cumberland (Came with Bruce to Get the 1939 Conference for Cumberland—and Did).

Leon Small, Water Engineer, Baltimore; N. D. Kenney, Consulting Engr., Baltimore; Geo. R. Hall, Acting Chief Engr., Md. Dept. of Health.

double insurance against faultily poured joints, the added first cost could be proved justified. He then stressed the advantages of proper trench preparation and care in tamping under the pipe, to the spring-line at least, before back-filling, as proper protection to both joints and pipe. Mr. Goff then gave some actual records to indicate results on a number of projects. One sewer 25 miles long had a leakage of but 3 per cent of the specified allowance; others 6 to 8 per cent only. The worst case was a 19-mile system in wet trench, with measured leakage of less than 3 gals. per min., representing 68 per cent of the specified allowance. The following figures were set by Mr. Goff as liberal allowances for leakage.

Size T.C. Pipe	Gals./Mile/Day
6 in. (or less)	4,000
8 in.	5,000
10 in.	6,300
12 in.	7,500
15 in.	9,500
18 to 36 in.	15,000

MR. GAINES, member of the firm of Ligon & Ligon, Baltimore contractors, was asked to present some comments on sewer construction from the contractor's point of view. In his interesting comments, he stated that his firm had laid about 60 miles of sewers with the type of joints favored by Mr. Goff, and had found them not difficult to make. He proved a believer in proper jointing and in the use of well points, which had saved both his firm and the municipality considerable money in the end. He personally preferred Mooretrench points. In making poured joints an all important matter, in his experience, was to employ round bottom kettles and put one man to continuously stirring to prevent segregation in the kettle. After learning this many troubles and loss of time and materials had disappeared.

"Rubber Pipe for Special Uses," by WALTER C. MUNROE, Chief Engr., Anne Arundel County Sanitary Commission, Glen Burnice, Md.

Mr. Munroe's paper, presented by Thomas Shives, Division Engr., with the Commission, told of the adaptation of reinforced heavy walled flexible rubber pipe for bridge crossings, and under-water channel crossings of pipe lines; also, as a sewage outfall line. The first line, installed some eight years ago, was a channel crossing of a water line made up of 50 ft. sections of 8-in. rubber tube. It was jointed with U. S. Navy bronze couplings, and floated into place to connect the two land ends of the cast-iron main, and then sunk by filling with water. The necessity of proper under-water trench preparation was emphasized, as was the ease of installation and raising of the flexible line for inspection. A more recent job had been a 350 ft. crossing with 3 inch rubber pipe. In this instance a 90-lb. pressure was maintained on the water main extension, the rubber pipe being jointed with cast-iron flanges and rubber gaskets. Experience had shown that such construction was especially worthy for emergency jobs and temporary lines. The other two applications were in outfall sewer construction—one case being a run of 150 feet out into a creek, already in service 6 years without any signs of deterioration of the rubber, and with the bronze couplings found in good condition. The most serious disturbance proved to be the floating up of the pipe at one time, the cause being trapped sewer gas. When considering the cost of cast-iron pipe laid on piling, the use of the rubber pipe had proved less costly by $2,000 in one case and $400 in the case of the sewer outfall. In reply to a question, Mr. Shives stated that the 4-ply, 8-in. rubber pipe, reinforced with copper-bearing steel wire and lined with pure gum rubber, was designed for 60 to 70 lbs. working pressure. For the pipe, alone, the cost was $5.08 per foot, with an added $2.00 per foot as the price of the couplings.

Glances at Recent Water Works Practices

"Glances at Recent Water Works Practices" constituted the presentation of high-lights of the newer developments in water works practices by four reviewers.

(1) *W. Compton Wills, Chief Engr., and A. J. Feeney, Asst. Engr. and Supt. Water Dept., Wilmington, Del.;* (2) *E. C. Cromwell, Chief Chemist, Baltimore Sewage Works, Richard Beckett, Chief Engr. Delaware Dept. of Health, and L. D. Shank, City Mgr. and Engr., Dover, Del.;* (3) *R. E. Kirchner, Mueller Co., John Cronnister, Mgr. Dorchester Water Co., Cambridge, Md., and A. B. Sanderson, Pittsburgh-Des Moines Steel Co.;* (4) *H. V. Donohoe, Chapman Valve Co., and Lee Williamson, Engr. Guggenheim Bros., New York City;* (5) *J. A. Armstrong, Retired Filtration Engr., Baltimore, Md., and R. A. Norris, Chief Engr., Springfield State Hospital.*

"Concerning Filter Plants," CHAS. F. THOMAS, Sales Manager, Roberts Filter Mfg. Co. of Darby, Pa., stated that the use of chemicals and mechanical gadgets on conditioning poor washing filter beds could not be considered a substitute for correcting the true evil—that of choked or faulty distributing underdrainage systems. He said that underdrains of ferrous materials had given so much difficulty, due to cloggage of the orifices, as to cause the present trend to non-corroding materials. In recent installations, he cited the Liepold type of false bottom of concrete with small glass tubes, and the Wheeler false bottom with inverted pyramids and balls, some of these being replacements in plants long suffering corroded underdrains. In other cases the pipes had been removed, cleaned, brass eyelets inserted in drilled holes, and coated with coal-tar enamel. Also the trend was toward red-brass, or copper laterals. In recent cases, drilled asbestos-cement pipe had been used. In his estimation, based on considerable experience, the trend toward the more expensive but overall less costly non-ferrous underdrains was thoroughly justified.

CARL J. LAUTER commented that the wood-slat false bottoms at the Washington plant had not been satisfactory. The washing was uneven. Now, one unit was equipped with a drilled and tar-coated steel plate bottom for study.

In reply to questions, Mr. Thomas stated that gravel bed depths of 18 inches seemed to be the preferred depth. For the new Clarksburg, W. Va., plant, "Transite" laterals were being specified.

"Some Paradoxes in Water Treatment," were presented by L. L. HEDGEPETH, Technical Service Director of the Pennsylvania Salt Company, based on recent disclosures—principally at the recent New Orleans Convention of the A. W. W. A. For example—It had been shown that lime after-treatment stopped red water complaints but not tuberculation of mains. The Committee on Carbon Specifications of A. W. W. A., in completing its report, had "agreed to disagree" and, thereby, left the specifications for carbon a matter of choice to best suit the needs at hand, incidentally placing much weight on the experience and integrity of the carbon manufacturer. An "Activated Alum" was being offered with insoluble inert matter, but on the other hand the usual filter alum carried its dead weight as water of crystallization. In chlorinator design stream lining had taken hold. The bell jar had lost its "top-knot" and artistry had otherwise been applied to produce the 1938 "Chlorinator Beautiful." In keeping; chlorine, already pure enough for the most exacting industrial usage, was being even further purged of its residual "sins," to make life easier for chlorinator users. To further confound the poor water works superintendent "chloramination"—the newly coined term—was not enough, so now the combination of copper and ammonia-chlorine treatment is offered, labeled the "Cupro-Ammonia-Chlorine" process, as the acme of algae control methods which "gets 'em coming and going."

Mr. Hedgepeth also commented on the Chlorine Safety Committee work in the A. W. W. A. and the Chlorine Institute Committee, in which he said a study of the possible elimination of the safety fusible plugs from chlorine containers had shown such plugs to be too essential to be dispensed with. In view of this, a study had already yielded an improvement in such plugs in the nature of a more dependable bond between the fusible metal and the brass plug—the point of weakness.

"Advances in Metering Practices," were to be presented by ALAN A. WOOD, Sales Engr., Builders Iron Foundry. Representing the same company, John R. Hartley, acting as the "pinch-hitter," talked from lantern slides which revealed the newer installations of telemetering equipment in water and sewage plants, and the advantages of air operation of metering equipment. The Cermak Station in Chicago was used as an illustration of bringing in individual meter readings (electrically) to a central point where each meter performance is visible, and the recording summation instrument is located. The summation reading is relayed also to other important points such as to the chemical feed control stations. Another new installation pictured, with several flows telemetered to summation stations, was Cincinnati's new filtration plant. Particularly interesting was the explanation of the newer air operation of metering equipment wherein the lead-lines, connecting the Venturi tube or orifice with the instruments, were small bore air tight tubes, kept filled with air rather than the liquid being measured. The air head differential at the indicating instrument automatically represents the liquid head differential through the metering element. Advantages cited: very small connecting tubing can be employed; the distance from tube to instrument may be considerably greater than before; the tube need not be free from high points, as previously; liquids subject to leaving deposits or to gas liberation or corrosive action, may be measured with the same facility as water.

L. H. ENSLOW, the final scheduled "glancer," being pinched for time, hit just a few high-spots in developments looking toward "Keeping Good Water Good." Chief amongst these were corrosion control methods; algae control; keeping coagulating basins and filters in aseptic condition; maintaining more nearly sterile conditions in distribution mains, to preclude bacterial aftergrowths, biological slimes, fermentation, after tastes, corrosion, and red or black water in dead ends. He said that lime treatment of the water had not been wholly effective in controlling corrosion and tuberculation, as revealed by Messrs. Wiggin and Norcom, rather definitely, at the recent A. W. W. A. Convention. The time had not come when the value of adequately protective linings for iron and steel mains, and a service pipe of greater resistance to corrosion than galvanized steel or iron, could be lost sight of.

(1) *Messrs. Ligon and Gaines of Ligon and Ligon, Water and Sewerage Contractors of Baltimore (Contributed Pointers in Sewer Construction from the Contractor's Point of View)*; (2) *A. B. Millard, Filter Operator, Fort Meade, Md., and "Red" Griffeth, Wallace & Tiernan Co.;* (3) *Ed. Eyler, Baltimore Mgr. Pittsburgh Meter Co., and Fred Stuart, Pres. Baltimore's Activated Alum Co.;* (4) *John Henderson, Asst. Engr., and N. L. Owings, Asst. to Chief Engr., Washington Suburban Sanitary Distr., Hyattsville, Md.;* (5) *F. H. Dryden, W.P.A. District Engr., Philadelphia, Pa., and Jas. V. Cannen, Chemist, Hagerstown, Md.*

Recounting advances in water softening: the automatic zeolite plants and, in the lime-soda softening method, the recent development involving passage of the treated water upward through a floating blanket of the precipitated hardness, seemed the most outstanding developments. Regeneration of zeolite with sea water was of markedly economic interest on the sea-coast or where salt water wells were available. Mr. Enslow also pointed to the new carbonaceous zeolite which, being regenerated with sulphuric acid rather than salt, produced a water containing carbon dioxide rather than sodium salts. The possibilities of the method were intriguing because of actual solids removal, including the sodium compounds, and ability to remove the CO_2 gas.

Concerning coagulants, the expansion in coagulation with ferric-salts, and the ability of the iron floc to remove silica, were worthy of comment. From all indications Baltimore's "Activated Alum" and the carbon-bear-

ing "Black Alum" were receiving a growing acceptance, since it had been reported recently that 138 plants were now using one or the other of these novel coagulants. Mr. Enslow regretted that time was not available to comment on developments in elevated storage, or ground storage with automatic booster pumping; consumer meters; public relations, and the like.

Pert Pointers on Filtration

"Filter Intestines Minus Coli-Aerogenes," by H. G. TURNER, Research Engineer, The Anthracite Institute, State College, Pa.

Mr. Turner's paper carrying the above intriguing caption, proved to be a thought-provoking discussion filled with questioning of opinions and practices handed down from father to son in the field of water purification. His paper will appear in full in a near future issue of this magazine. For the present some of the "pertest pointers" will be noted here. Mr. Turner made the observation that in his travels filters in best condition had not been the modern high velocity wash filters but rather those of older design, for the most part employing air scrubbing and low velocity wash. He, therefore, asked the question, "Why was air wash discredited?" and answered by saying that the principle was now being proven the correct one by the attention recently given surface wash schemes. Certainly the so-called high-velocity wash had failed to keep filter beds free of grain-film and dirt accumulations. The explanation of "the why," he demonstrated by lucid illustrations. Further, the high velocity wash required too great distance between the bed surface and the wash trough lip, and the larger and heavier particles of floc and dirt had too far to travel from normal sand level (through the floated sand) to the wash trough. His proposal is a method of grinding up the large dirt particles into smaller ones; minimum free board and, thereby, minimum wash velocity for the lift required. From father to son had come the law of the 2 gal./min. per sq. ft. of filter area. He had found no answer to the why of this "standard" rate, lest it be that a filter could become 50 per cent clogged before the true effective rate became 4 gal./min. per sq. ft. Mr. Turner said that his impression was that considerable taste and odor troubles could be traced to dirty filters and the decomposition in basins and filters. It was his impression that filters had no place as biological units, and the more sterile the beds and underdrains the better. At least that appeared to be so from observing numerous plants where prechlorination was being practiced regularly, and comparing findings at plants not so operated.

In discussing adjuncts to filter washing, Mr. Turner said the air wash seemed the most overall effective and the surface jet wash next. He described an ingenious

"Glancers" at Water Developments

L. L. Hedgepeth, Penna. Salt Co., Philadelphia; J. R. Hartley, Builders Iron Foundry, Providence; C. F. Thomas, Roberts Filter Co., Darby, Pa.

More "Glancers"

W. Donaldson, Chief Bureau of Sewage Disposal, New York City (The "Admiral" Took Us Abarging Out to Sea); A. L. Genter, "E.E.E.," Baltimore (*Elucidating, Elutriation-Engineer); L. H. Enslow, Editor, WW&S. New York City (Late on the Program, with Lots to Say but Stymied by Time).*

but simple rotating surface water wash-arm, developed by Palmer of the Erie, Pa., plant to replace a 30 in. wash rate, giving poor results. He commented on the Jewell System of subsurface filtration and washing, as a commercial development which seemed to be basically sound and in the right direction to make the fullest use of the "loafing" areas of the filter bed.

"The Baltimore Grit Chambers," by A. RUSSELL VOLMER, Whitman, Requardt and Smith, Engineers, Baltimore, Md.

Mr. Volmer's paper, read by N. D. Kenny, an associate, constituted a brief description of the $2,000,000 construction program under way at Baltimore's Back River Sewage Disposal Plant, which includes an activated sludge plant and grit chambers to serve existing 26 year old trickling filter plant and also the new plant along side. Although designed and completed as a separate sanitary sewerage system in 1912, grit has been sufficiently troublesome (3 cu. ft./mg.) to justify the new grit chambers. Three Dorr Detritor units 50x50 ft. in plan had been selected to provide velocities between 0.5 and 1 ft./sec., with a detention period of 100 seconds, at a cost of $147,000 complete ($5.00 per mg.) for the design capacity of 300 mgd. Mr. Volmer's paper included a description of the control inlet gate structure and adjustable flow distribution fins across the influent end of each chamber. Also, there was presented a discussion of the laws pertaining to grit subsidence, in which the value of floor area and shallow flow depth of basins was clearly elucidated by formula. The conclusion reached was that all grit particles greater than 0.3 mm. diameter should be removed ahead of settling units. To insure as much, 50 per cent had been added to the theoretically computed area. Interesting was the reminder that once on the floor of a chamber or channel, 30 to 40 times the velocity which allowed the subsidence is required to lift the grit into the velocity zone.

"Training of Plant Operators," by L. C. MACMURRAY, Resident Engineer, Maryland Department of Health, Baltimore, Md.

Mr. MacMurray, pointing out the too well known fact that the average elected municipal official has the impression that there is no particular problem in purifying and supplying a pure water, related how operator training is conducted by the Maryland Department of Health at strategically located plants, and then followed up by individual coaching of operators in their own plants. Mr. MacMurray said that the Operator Short Schools sponsored by the Association, the University of Maryland, and Department of Health, had been found very helpful. The training work, as a whole, had led to bet-

ter understanding between the public, Water Departments, and the State Department of Health, and had effected safety and economy in operation, elimination of cross connection hazards, regulated recreational use of water shed areas and reservoirs.

In discussion, Chairman Hopkins stated that not only did small plant supervisors need training but the men actually on shift duty in the larger plants needed such training, and ability to exercise some individual judgment.

At this point the new president C. J. Bruce (Cumberland, Md.) took the Chair and added the thought that operators subscribing to and reading the leading technical journals were the better prepared operators. From experience, he wanted to urge every grade of operator to keep abreast of "What's What" by reading the journals and studying their jobs. He added, that the ad for the journals mentioned was *not* paid for. (Laughter.)

"The Mine Sealing Program in Maryland," by GEORGE L. HALL, Acting Chief Engr., Maryland Department of Health, Baltimore, Md.

Mr. Hall said that drainage from Maryland mines contributed an estimated 77,300,000 pounds of sulphuric acid each year. In the mine sealing program, begun late in 1935 in Maryland and financed largely with Federal funds, 2,000,000 lbs. of acid from mines sealed to date had been reduced by 59% to 900,000 lbs. per year. Under way now was the important sealing of surface openings, and water diversion from openings above worked out areas of active mines. Already 47 of the 53 worked out areas of one active mine had been sealed in an effort to eliminate much of the 4,000,000 lbs. of acid leaving this particular mine. The part played by the U. S. Public Health Service in contributing $16,000 for the year, plus the services of the supervisor, was highly appreciated.

Ferric Sulphate as a Coagulant

"Studies of Ferric Sulphate as a Coagulant," by J. G. PATRICK, Chemist, W. Va. Pulp and Paper Co., Luke, Md.

Mr. Patrick presented a resume of their findings at Luke, Md., involving the use of "Ferrisul" as the coagulating chemical in treatment of the Potomac water, having considerable iron and alumina in solution (mine drainage the source), and pH of 4.5 at times of low river stages. The ends sought were more perfect silica removal; a quicker floc formation; production of a less corrosive water with flocculation at high pH; complete manganese removal; introduction of flocced water at basin center beneath the floating blanket of iron floc, stabilized by the high pH value maintained; possible economies in chemical cost. The results were to be used in designing increased plant capacity, and probably without further enlargement of the coagulating basins now serving the existing plant. Representative runs were made with a small pilot plant at rates of 1 in. vertical rise per minute (at 2 gal./min. flow) the water entering the deep tank through a perforated pipe grid on the floor.

Results in general showed no difference when lime or "Ferrisul" was added first. Coagulating at pH 9.4, essentially a complete removal of iron and manganese was had, with a 63 per cent reduction in silica, but the calcium hardness was doubled. Studying the sludge blanket effect, in depths from 2 to 6 feet, it was apparent that efficiencies improved as the sludge depth increased. Activated carbon, with the Ferrisul, improved coagulation but did not reduce costs; neither had pre-chlorination at the high pH. The average cost at 2 grains of lime and 1.5 grains of iron sulphate proved almost on a par with the present treatment, involving alum and caustic soda, but generally were somewhat higher.

Glances at Sewage Treatment Developments

In a manner parallel to that followed in the case of water supply developments, four speakers presented "What's New in Sewage Treatment."

(1) *"Bob" Turner, Sales Engr., Rensselaer Valve Co.;* (2) *P. L. Smith, Asst. Chemist, Balto. Sewage Works;* (3) *R. L. Carry, Technical Service, Mathieson Alkali Works;* (4) *John McKague, National Meter Co.;* (5) *R. G. Grunden, Supt. Sewerage, Easton, Md.;* (6) *Ralph Kelly, Hydraulic Equipment Co.;* (7) *"Bob" Regester, Whitman, Requardt & Smith, Engrs., Balto.;* (8) *Wm. B. Cambridge, Hersey Meter Co.*

"Some Operating Experiences in New York City," by WELLINGTON DONALDSON, Director, Bureau of Sewage Disposal, New York City.

Mr. Donaldson's informal presentation, with the aid of lantern slides, proved to be one of the most interesting and illuminating (likewise entertaining) features of the meeting. Especially interesting was his description of New York's sludge handling methods. In this, he took his listeners on "A Trip to Sea" on one of New York City's new and rakish sludge ships, especially designed as transports for sludge to the dumping areas some 32 miles distant. These interesting vessels, of 1,500 tons sludge capacity, powered by twin Diesels and manned by a crew of 13, cost $500,000 each. From elevated sludge storage bins a ship is loaded in 1.5 hours. At the dumping grounds the load is dropped through the bottom in 7 to 8 minutes, and the complete trip to sea and back requires but 7 hours, with two vessels in continuous service. The "Admiral" made many of his listeners envious when he told how he had found a refuge from telephone calls and some peace, for at least 7 hours, by "taking to sea" on one of the sludge vessels.

In a brief review of operating experiences at the new Ward's Island plant (180 m.g.d. capacity) treating sewage from 20 per cent of New York's population, Mr. Donaldson told of the unusual problem from scum in unanticipated proportions. Screenings maceration, prac-

And Still More "Glancers"

Alan W. Darby, The Dorr Co., New York City; J. G. Patrick, W. Va. Pulp and Paper Co., Luke, Md.; Jo. J. Gilbert, Link-Belt Co., Philadelphia.

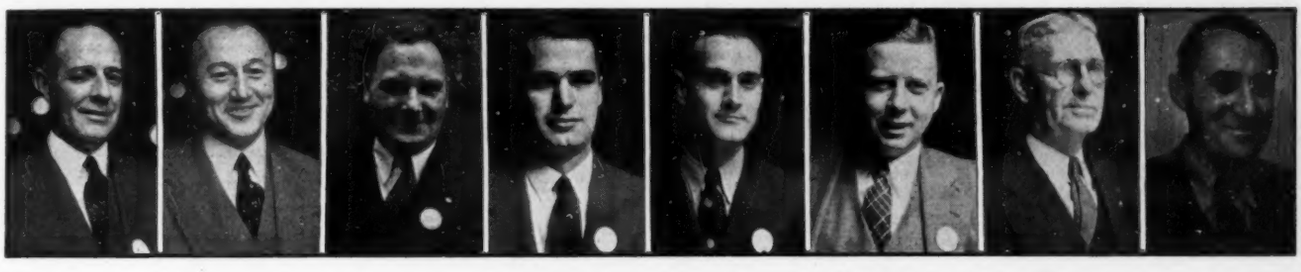
ticed at the screen and grit chambers, in combination with excess activated sludge wasted to the influent sewage, plus some grease had been brought to the surface of the primary tank by the release of entrained air. Carrying higher levels at the grit chamber shaft corrected the trouble. Analyses showed the scum to be chiefly pulped paper and activated sludge buoyed by air alone or air plus grease. To avoid the objection of grease on the sea surface by sludge dumping, two grease incinerators had been hurriedly installed to completely destroy the scum.

Experiences with a large capacity American Centrifugal machine for dewatering coarse and fine screenings, grit, and sludges, were of considerable interest in view of the carefully controlled and checked test operations. The results, in brief, showed screenings cake yields of 700 to 800 lbs. of dry solids per hour, as compared with the guarantees of 500 lbs. per hour output. In respect to dryness of the cake, the average guarantee of 65 per cent moisture content had not been reached—the general average being 68 to 70 per cent. However, the actual quantity of solids output per hour was greater than that to be had under the yield guaranteed. From digested sludge (9 per cent solids) the yield of dewatered cake (50 per cent water) was better than 700 lbs. per hour of dry solids. The machine effluent carried roughly 2 per cent solids, but it was Mr. Donaldson's opinion that this effluent could be clarified and returned to the crude sewage by chemical precipitation. Digested sludge (9 to 10 per cent solids) transported by scow from the Coney Island plant was considered of value in land improvement in New York's Marine Park. On the grounds of the Coney Island plant, a mixture of 50 per cent clean sea sand and 50 per cent pulverized air dried sludge cake had been found a good combination for grass. Disposal of Coney Island sludge on Marine Park would be continued for years, although vacuum dewatering had been arranged for.

Digested sludge (9 per cent solids), transported by scow from the Coney Island plant, had proven of value in land improvement in New York's Marine Park and at Coney Island, a mixture of 50 per cent sand and 50 per cent disintegrated air-dried sludge cake had been found a good combination for grass. In this manner the disposal of Coney Island sludge would be continued for some time, with ultimate dewatering on the vacuum filters not now operated.

Concerning power development with gas engines, the experience with three engines (300 HP each), at Coney Island, had been so satisfactory, as an unfailing source of power, as to warrant plans to develop digester gas power at other projected plants. Anticipated yields equal to or better than that of 1 KWH per 26 cu. ft. of digester gas consumed at Coney Island were reasonably to be expected in the contemplated installations. Incidentally, the latter plant, employing chemical precipitation during the bathing season and separate digestion the year round, was to be doubled in size to 70 m.g.d. capacity in the not distant future.

A major program of chlorination had involved complete chlorination of all sewage entering Jamaica Bay. In addition to the Coney Island station, five more stations (3 major plants) had been established and, inclusive of chlorine for chlorinated-copperas production as coagulant, one million pounds (500 tons) of chlorine had been applied in 1937. (It is the opinion of your reporter that the mechanical layout of New York's chlorinating stations, constructed and operated under the supervision of Mr. Donaldson, may be considered models in respect to design and operating features.—Ed.).



(1) *Gus. Requardt, Whitman, Requardt & Smith, Engrs., Baltimore;* (2) *H. A. Hoffer, Asst. Genl. Sales Mgr., U. S. Pipe & Fdy. Co., Burlington, N. Y.;* (3) *F. H. Townsend, Asst. Engr., Wash. Suburban San. Distr., Hyattsville, Md.;* (4) *John Kelly, Darco Sales Corp., New York;* (5) *Burt. Graham, Chief Chemist, Activated Alum Co., Baltimore;* (6) *W. A. Welch, Industrial Chemical Sales Co., New York;* (7) *"Ned" Herbert, Supt. Water Wks., Norfolk, Va.;* (8) *R. J. Stewart. Supt. Utilities, Edgewood Arsenal, Md. (Supplies Water to 120 Chemists Who Think the Formula for Water Is H_2O + Cl.)*

A. A. Bailey, Engineer, Montebello Filters, Baltimore (For Two Years a Successful Gadgeteer); L. C. MacMurray, State Dept. Health, Baltimore (Helps Operators Help Themselves); H. G. Turner, The Anthracite Inst., State College, Pa. (Tears Filters Apart—Says They're Being Built and Operated Under the "Grandfather Clause").

"Developments in Sludge Filtration," by A. L. GENTER, Chemical Engineer, Baltimore, Md.

Mr. Genter, in reviewing the trends to sludge dewatering by mechanical filtration, stated that 83 per cent of all vacuum filter installations had been made within the past 3 years; 64 per cent being within 2 years. For sludge conditioning, ferric-chloride continued to be the best coagulant. The practice of employing high lime application (10 to 12 per cent) to digested sludges to curtail ferric chloride requirements to 2 to 3 per cent, had been troublesome in respect to blinding of filter cloth and the supporting wire mesh beneath. Furthermore, the cost was about equal to that of eliminating lime and tripling the ferric chloride dosage. Mr. Genter, father of the process of sludge washing known as elutriation, presented data to show the very considerable overall savings which sludge washing effected. In removing the buffer compounds thus, there was noted a material reduction in acidic coagulant demands; also, speeding of filtration and boosting the capacities of filters. Based on computations and operating data available, it was predictable that sludge digestion (gas utilization) and elutriation offered a net cost reduction of roughly 80 per cent over known costs of dewatering of undigested sludges on vacuum filters. Estimates on one small plant revealed net costs of only $2.70 as compared to $17.50 per day.

In elutriation, the fill and draw method had been outmoded by the more effective and economical counter flow (continuous) process, with two tanks in series and requiring but 33 per cent volume of washing liquid (plant effluent or water as the case might be), for like results. Such elutriating tanks need provide only 1.5 to 2 hours detention, round tanks with central inlet being preferred. Mr. Genter pointed to the Washington, D. C., and Winnipeg, Canada, plants with filter cake yields of 9 lbs. dry solids per square foot per hour (digested sludge) wherein elutriation had made such possible, with between 2 and 2.5 lbs. of ferric-chloride consumed per 100 lbs. of dry solids yield. Moisture of sludge cake produced was 63 per cent at Washington; 65 per cent at Winnipeg. The Greensboro, N. C., plant (not yet in service), was provided also with counter flow elutriation tanks of center feed design to remove 80 per cent of a possible 90 per cent removal of the soluble compounds from the sludge. Mr. Genter pointed out, as an important element in sludge conditioning, the matter of instant rapid mix followed by the least delay or further disturbance in getting the treated sludge to the filter, if maximum chemical economy was to result. For instance, a saving of 1 per cent in ferric chloride required in the Baltimore scheme would amount to $6,000 or more saving in operating costs per year; at Washington $5,000. Baltimore, with elutriation, expects its conditioner cost to approximate 50 cents per ton of dry solids; in Washington $1.00 per ton. Baltimore has a source of low priced copperas (sulphate of iron) available and will produce chlorinated-copperas, proven the most inexpensive coagulant under the circumstances. (Mr. Genter's paper, to be published in full, contains much enlightening discussion of sludge dewatering and additional operating pointers of merit which can not be covered in this brief space.—Ed.).

"Mechanical Flocculation," by W. A. DARBY, Sales Engineer, The Dorr Co., New York City.

Mr. Darby in reviewing progress in mechanical flocculation of sewage, pointed first to the history of the flocculator in water coagulation, wherein chemical cost reductions had been sufficiently pronounced to pay for the installation in 1 to 3 years. Now, in sewage treatment, chemical precipitation had been likewise aided by mechanical floc formation to a point that 90 per cent suspended solids and at least 75 per cent B.O.D. reduction could be predicted. Even without chemical aids, flocculators had been responsible for a natural agglomeration (30 minute period) of non-settleable solids, to enhance solids removal in primary tanks by as much as 50 per cent; and to a lesser extent boost B.O.D. reductions. Advantages cited for mechanical flocculation were reduced chemical costs; improved treatment efficiencies; less loading on secondary units or streams; more consistent plant performance.

"The Circuline Clarifier," by J. J. GILBERT, Sales Engineer, Link Belt Co., Philadelphia, Pa.

Mr. Gilbert described and enumerated the unique features of Link-Belt's "Circuline" Clarifier. The rotating straight-line collector is driven from an arm that "walks the chain" in the effluent launder of the circular tank. The tank design involves a center feed arrangement, designed for maximum efficiency in flow distribution by unique baffling arrangements. Other features illustrated by slides, were the center sludge sump with revolving cover to maintain maximum sludge concentration, and the travelling scum flight with its scum-pocket. Several slides of recent installations were shown by Mr. Gilbert, who emphasized the fact that the straight-line conveying flight runs on a track which holds the weight of the scraper blades off of the floor to preclude wear and high power load.

Gadget Contest

This year the Gadget Contest was hardly a contest, with but two gadgets entered. That by A. A. Bailey, of the Montebello Filter Plant, comprised a chemical dissolving hopper similar to a sand washer, with an ejector at the bottom, and reported to dissolve 300 lbs. of ferrous sulphate in 2 minutes. The other, entered by Sam Claman, chemist with the Maryland Department of Health, was a self-starting syphon constructed of glass. It was suggested for syphoning sewage samples, dilutions in filling B.O.D. bottles, or other liquids not intended for self-respecting laboratory workers to drink.

[Neither the length nor "width" of this report does justice to the interesting program of the 12th Conference of the Md.-Delaware Water and Sewage Works Assn.—Ed.]

CEMENT-LINED PIPES FOR SALT WATER SUPPLY

Use of sea water for sanitation and fire fighting purposes is almost unprecedented in the United States, but is practiced in the Virgin Islands because of the low precipitation prevailing there and sparcity of ground water.

In Charlotte Amalie the water is pumped directly from the sea into fire service mains and to a concrete tank 250 feet above the town. This tank serves a distribution system to the homes for sewage purposes. The expanded system, which includes two new power pumps, will add a pumping capacity of 12,000 gallons an hour.

The salt water system was developed originally to serve the King's Quarter area of Charlotte Amalie, but gradually has been extended over the most thickly populated sections. Generally, the method has been successful, but it has created one major problem which engineers believe will be overcome on the new $50,000 PWA project. Corrosion, caused by the salt water, has entailed considerable replacement of the cast iron pipes. The new pipes, which include over 7,000 feet of water mains and more than 5,000 feet of sewers, are likewise of cast iron construction, but have been lined with cement to preclude salt water attack.

THE HUMAN ELEMENT IN MEETING EMERGENCIES*

By H. W. NIEMEYER
Asst. Supt. of Distribution, Indianapolis Water Company

THE public water supply is one of life's necessities —a vital part of man's health and comfort in his modern mode of living. Safe and dependable water service, always available, has become a convenience around which many daily habits have been formed. For these reasons alone, immediate attention is required when the supply is interrupted. In our northern states, when customers neglect to provide adequate protection for their plumbing systems, frost not only disrupts the supply but adds to the emergency nature of the situation through bursting of pipes. While such failures may be considered to be a responsibility of the customers, the water utility becomes involved by reason of its control of the service curb stops and the meters, located within or adjacent to the customers' premises, one or both of which may also become affected. The water utility, therefore, is obligated to perform an emergency service for customers during winter months which adds to the duties of normal operation.

In order to furnish a background for a discussion of the subject, the effect of the severe 1935-36 winter on customer service will be illustrated from records of the Indianapolis Water Company. The accompanying chart shows the burden placed on the company during the most severe part of that winter, in comparison with a more normal service load during a corresponding period of another year. The number of service orders completed, as shown on the chart, reached a total during the cold wave which were 169 per cent of normal. Furthermore, during the emergency period, snow, ice and the low temperatures combined to create operating handicaps that doubled the time requirement to complete a service job under normal conditions. Continuous exposure to the low temperatures and biting winds caused extreme discomfort and, frequently, distress to the service men. These were the emergency conditions to be met.

Planning for Emergency Service Efficiency

In order that the service men will be subjected to a minimum of hardship, the most efficient customers' service possible must be built up through perfect coordination of all the personnel responsible to the service. Such efficiency plans as may be necessary to the service men's comfort and safety is in the end a component part of satisfactory customers' service and must be considered for other desired results as well. Promptness of service is, of course, foremost. The contacts with the customers must be pleasant. Billings must continue without errors, although the turnover in meter replacement may be high. Water waste from burst plumbing and meters must be held to a minimum. The cost of the service must be consistent with the economical operation of the plant. With the above premise stated, various phases of operation that lend themselves to achievement of these desired results can now be briefly discussed and helpful practices will be suggested.

*A paper read before the Indiana Section of the American Water Works Assn. Published by permission of the editor of the A. W. W. A. Journal.

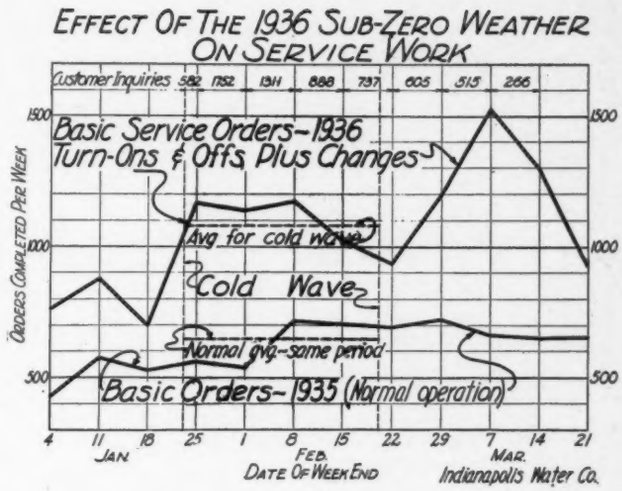

EFFECT OF THE 1936 SUB-ZERO WEATHER ON SERVICE WORK
Customer Inquiries 582 1152 1311 888 737 605 515 266
Basic Service Orders-1936 Turn-Ons & Offs Plus Changes
Avg. for cold wave
Cold Wave
Normal avg.-same period
Basic Orders-1935 (Normal operation)
ORDERS COMPLETED PER WEEK
1500
1000
500
4 11 18 25 1 8 15 22 29 7 14 21
JAN
FEB.
MAR.
DATE OF WEEK END
Indianapolis Water Co.

Chart Showing Effect of Sub-Zero Weather on Service Work

Helpful Practices

Any step taken to induce a customer to overcome his neglect is in the right direction, and constitutes the best and most lasting service to customers that can be given.

Warn the Customer

Periodical warnings on the costliness of freeze-ups given the customers through the media of leaflets, posters in the office lobby, or by newspaper ads are all good. These warnings should urge the customer (1) To close all basement openings; (2) To insulate all exposed piping and the meter; (3) To keep the stop and waste valve in operating condition; (4) To have the service disconnected and the plumbing drained, in case of an extended absence from a property.

Verbal notices should be given to the customer by the service men and the meter readers in their routine work when a bad condition is noted. If but 10 per cent of the total freeze-ups could be avoided through work of this nature, it would prove very worthwhile to the water utility and a saving for the customer.

While most companies have adopted a penalty policy for meter damage by making the customer liable for repair costs, this plan is not very effective because it does not eliminate the cause. Moreover, it usually invokes animosity towards the company. Perhaps forceful correction of a faulty setting through service disconnection, after due warning followed by a subsequent damage offense, would be better. This plan would at least require a customer to guard his own service and would eliminate repeat cases of damages and avoidable service calls. In the case of a water company, a policy with respect to meter damage requires careful consideration if the customer relationship is not to be strained and yet the policy is to become efficiently effective in its influence.

Keep Meter Boxes Locked

As openings at the meter pit top permit escape of the warm air inside and reduce the temperature of a pit interior to below freezing, meter box lids should always be locked in place. The readers should be careful to see that they do not become lax in securing lids in place after reading the meter. This is an operating responsibility of the utility that the customer can justifiably claim. It should not be regarded lightly because of the hazard factor and inviting meddling, in addition.

Rigidly enforced company regulation of new or altered plumbing installations should be provided to insure frost prtection to the service line and the meter. Basement settings for the meter should be used only where there is reasonable assurance that the meter is to be safe from frost. Stop and waste valves should be required and so placed that all runs of plumbing can be controlled by the customers. In addition, only a minimum amount of exposed piping should be permitted on the supply side of the valve. During an emergency it is a decided advantage to have this valve located on the supply side of the meter because in the majority of freeze-ups the meter is damaged and the customer can then stop resultant water waste pending the arrival of the service man. This valve also permits the service man to change the meter and to resume service more quickly; otherwise the curb stop must be used, with a considerable delay if the stop box is covered or clogged.

Record Keeping and Location Markers

The Indianapolis Water Company maintains a permanent record of services that is invaluable in times of emergency. Complete installation data is filed for each service to show the box location, as measured from property lines or hydrants. In addition there is a building diagram, indicating the approximate meter location, record of the meter size and its type of connection, kind of stop and waste valve, etc. The record is maintained in the Service Department so that all pertinent data is available to either the day or night service men. The record also allows plumbers to receive stop box locations by phone and often permits the phone personnel to give helpful advice to the customers as to how he can best aid himself with a minimum of delay, inconvenience or damage. Curb markings, with a distinctive color of paint blue, are also used to give a line on the stop box. The markings are made by the service men in their routine work. While present regulations require the stop-box to be located within building lines, there have been many boxes irregularly placed in the past and these curb markings have quite often been of particular assistance in quickly locating a box under dirt, snow or ice.

The High Cost of Tool Economy

Economy is not to be measured by the investment in tools and equipment alone. The cost of service tools is so little that it is quickly offset by improved service and savings in time. In addition to the stop key, pipe wrenches and miscellaneous small tools, the service tool kit should provide adequate box cleaning tools and a dependable box locating instrument. Means for thawing ice in the curb boxes should also be provided. Dropping some carbide, used in acetylene lighting, into the box has been recommended for this purpose. It is well to remember that adequate tools are essential to efficiency and that many second trips to complete an order can be avoided if the service man is equipped with tools to handle the unusual as well as the usual conditions.

Comfort and Safety Costs Little

It is important that automotive equipment be maintained in excellent mechanical condition because road failure of a car during an emergency means time lost for a service man when it can least be spared. Road failures can be held to a minimum through periodical inspections of automotive equipment, plus preventive maintenance by competent garage mechanics. Closed type cars should be provided with efficient heaters and radiator covers, which will at least give the service man relief from the cold between stops and will provide a warm place for the men to remove their gloves to fill in their job reports. Windshield defrosters, or small windshield clearing fans, used in conjunction with the heater, will provide the clear vision so essential to safe driving in the winter. Adjustable spotlights installed on those service cars used for night emergency service are useful in many ways. They may be used to locate house numbers and to spot curb boxes or meter pits. And, "a little light on the subject" is particularly useful at night if a curb box has to be cleaned or uncovered before it can be used.

Work order forms should be so designed as to give the service man all necessary information and require only a minimum amount of writing on his part to report his work. The use of the check-marking system on forms, where identical data is repeated on a large number of sheets, is advisable. This item may appear unimportant at first glance but if you will add up the total writing involved in connection with the total orders of a day, even though it be minimized, you will realize that the time element merits careful thought.

Competency in Handling Telephone Complaints

The phone contacts with the customer forms a phase of customers' service that cannot be overemphasized. With customers in trouble, these first contacts have much bearing on their reactions and determines to a large extent the number of unnecessary trips to be made by the service men. Employes selected for this telephone work have a difficult assignment, for the contacts are made with all classes of people of different temperaments, many of whom cannot speak English distinctly (especially when a little excited), many who know but little about plumbing systems, and the most difficult are those who expect or demand instant attention, however trivial their trouble. In addition to those primary requisites for phone work the employee assigned must be qualified and trained for service calls so as to be able to determine with fair accuracy the necessity for company service, and the extent of urgency of service requirements. Extreme care must be taken to obtain exact addresses and to correctly record them on the orders to the service department.

All orders must, of course, be centralized in the Service Department. Here they should be first checked for duplications and then for urgency of dispatching. Service orders should be routed to avoid overlapping of the service men's routes and to avoid any unusual delay on any one order. For instance, the City of Indianapolis is divided into eight service districts. Orders are routed so that the men leave their headquarters (these being centrally located) each morning and noon, and work out to the outlying edge of town by mid-morning or mid-afternoon. At this time they receive, by phone, all urgent orders that have accumulated since they started out. These new orders are cared for as the men work their way back into headquarters. Approximately 60,000 service orders are handled annually by this group, with some 40,000 of these being in response to customers' calls.

Handling Rush Orders

Rush orders, demanding immediate attention, are cared for by special trip of the repair men in the meter shop who have had service experience. The industrial meter service man and his helper also "float" in all districts to

care for service to large installations and for any other unusual jobs that may be turned in by the district men. Twenty-four hour emergency service is also available to customers through regularly assigned service men on duty during night hours, week-ends and holidays, the regular personnel being supplemented by others during emergency periods. A record of all incoming requests for service must be kept to avoid duplications, and so maintained that the progress on any one job can be given on the instant if the customer calls about it.

The Human Equation

The service personnel itself is most important to satisfactory customers' service. It is this group that must carry the brunt of an emergency and toil unceasingly without regard for themselves although the hardships are many and trying. Certainly, they must be well qualified for their position—courteous, neat, accurate, fast, dependable, and physically capable of standing up under the emergency working conditions. They must be adequately trained, thoroughly schooled on the "do's" and "don'ts" of customers' service, and above all, imbued with a sense of responsibility to the customers. It thus follows that green men cannot be hired temporarily for the duration of an emergency without courting costly mistakes. Since the size of the personnel must necessarily, for economical reasons, be based on normal peak demands, the reserve service men must be drawn from regular employes, such as tappers, truck drivers, maintenance men or others who are already somewhat familiar with the work and can be placed on the job with but few instructions, and yet be depended upon for the work.

Reviewing the factors that affect customers' service, it can be seen that the human element in meeting emergencies reflects back to the management which establishes company policies, to the foremen who direct the work, to the office personnel who handle the phone calls and records, and to others, as well as the service man himself. It is only fair to the service men, if he is to accept his public responsibility and give his best in service, that those who have acted before him must have, first, given their best. Those of us who watched the service men meet the 1935-36 emergency in Indianapolis know that they are deserving of that consideration. When such consideration is given, customers' service will be at its best, both in normal and emergency operation.

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DENVER'S SEWER SPAN
(A Correction)

In our last issue was pictured "The World's Longest Self-Supporting Pipe Span," with a brief account of this interesting river-crossing span of Denver's new intercepting trunk sewer to the treatment plant.

In this article we credited Black and Veatch of Kansas City, Mo., with being consulting engineers on the Denver sewerage project. In this we have been corrected by a member of the firm of Black and Veatch, who states that their part of the project covered only the new treatment plant at the terminus of the river span. The span was a part of the intercepting sewer project which was designed in the offices of A. K. Vickery, City Engineer, and Charles A. Davis, City Sanitary Engineer. The detailed design of the long and novel pipe-span was made under direction of G. H. Garrett, Chief Engineer for the fabricators and erectors—The Thompson Mfg. Co. of Denver. We regret that we over-shot by 210 feet in giving Black and Veatch credit on Denver's sewerage project and are happy to credit those who were slighted.

N. Y. STATE SEWAGE ASSOCIATION
Inspects New Plants of Buffalo and Niagara Falls

THE Spring meeting of the New York State Sewage Works Association was held in Buffalo, N. Y., June 3 and 4, 1938.

Following the inspection of Gadgets, fifteen in number, displayed by the members of the Association, the group were welcomed by Frederick W. Wing, City Engineer.

Charles R. Velzy, Resident Engineer for the Consulting Engineers, gave a talk illustrated with lantern slides on the "Construction of Buffalo Intercepting Sewers and Treatment Plant."

Dr. George E. Symons, Chief Chemist of the Buffalo Sewer Authority, presented a paper on the "Niagara River Pollution Studies, 1936-1938."

After the close of the technical session, the group proceeded in busses to the Bird Island sewage treatment plant of the City of Buffalo, which is nearing completion. The busses and luncheon at the plant were furnished through the courtesy of the manufacturers of equipment and contractors for the Buffalo sewage treatment plant and the Niagara Falls sewage treatment plant.

In the late afternoon the executive committee met with the group of members in the western part of the State which is now organizing a Western Section of the New York State Sewage Works Association and informally approved their by-laws.

Marshall Receives Rating Award

In the evening, following the usual informal banquet, Elvey A. Marshall was presented with the Rating Committee award in the form of a silver-plated loving cup for the excellence of his reports on the operation of the sewage treatment plant of the City of Geneva for the year 1937.

Saturday morning sixty-seven men arose in time for the sunrise breakfast and "Question Box" conducted by C. C. Agar and Morris M. Cohn. The results of the balloting in the Gadget competition gave the first award to C. B. Kelly, Sanitary Chemist of the Conservation Department, Freeport, L. I.; the second to E. A. Marshall and E. A. Larsen of Geneva; the third to Glenn E. Pinkney of Webster, N. Y.

Following the sunrise breakfast, the group proceeded by private automobiles to Niagara Falls, where H. W. Clark, City Engineer, presented a paper on the "Design and Description of the Niagara Falls Intercepting Sewer System and Sewage Treatment Plant." After luncheon in the Cataract House the group proceeded to the inspection of the Niagara Falls treatment plant, which is hung on the face of the Niagara Gorge and has many unique features.

The following papers were presented in the Technical Sessions:

"Design and Unusual Features of the Buffalo Sewage Disposal Project," by Samuel A. Greeley, Greeley & Hansen, Engineers, Chicago.

"Niagara River Pollution Studies, 1936-1938," by G. E. Symons, Chief Chemist, Buffalo Sewer Authority.

"Construction of Buffalo Intercepting Sewers and Treatment Plant," by Charles R. Velzy, Resident Engineer, Greeley & Hansen, Buffalo.

"Design and Description of Niagara Falls Treatment Plant," by H. W. Clark, City Engr., Niagara Falls.

The next meeting of the Association will be a joint meeting with the New England Sewage Works Association at the Hotel Bond, Hartford, Conn., October 6, 7 and 8, 1938, at which manufacturers' exhibits will be displayed.

The Editor's Comments

The Independent Engineer

BEFORE the New Jersey Association of Professional Engineers at its last annual convention, amongst the discussions heard was a particularly significant one presented by C. J. Velz of Fanwood, New Jersey. The expressed thoughts of the speaker, in respect to today's "Independent Engineer," and the part that he must play in order to justify such a title by functioning to insure fair and effective competition in public works construction, deserve much consideration and thought.

So filled with pertinent and significant statements was Mr. Velz' discussion, that we asked him to submit the same thought for reproduction on this page. From his discussion the paragraphs to follow have been drawn.

"In the endeavor to protect a free economy one important factor demands serious consideration—a factor vital to the engineer, the contractor, the manufacturer and the taxpayer. That factor is competition. Time has dulled the edge of competition. It is the purpose of this paper to stimulate evaluation of the positive, the constructive aspects of competition as applied to public work, particularly water and sewage projects.

"An age-old problem, filled with complex ramifications cannot be resolved to simple terms. Nor can fair and effective competition prevail without a belief in its inherent values, sufficiently strong to prompt the patience and effort necessary to obtain it. Few challenge the principle of competitive bidding in public work; the law has frequent references to it and the public has come to take it for granted. However, statutory provision and court decisions are no guarantee for competition; the *principles* must be lived.

"The most strategic group to achieve the active practice of these principles is the engineering profession. The engineer, as umpire between the contractor and manufacturer on one side and the taxpayer on the other, carries a heavy responsibility in laying out the plan, drafting the rules and controlling the execution. These responsibilities are the very foundation of the independent practice of professional engineering.

"With the advance of mass production methods more of the responsibility for detailed design of individual products is being absorbed by the manufacturer's research staff, with less dependence upon the professional engineer. Such research and intensive specialization afford a rapid technical advance with reliability of product. It should be encouraged. In maintaining the independence between buyer and seller it is the function of the professional engineer to integrate the elements into the workable whole and to insure, by fair and effective competition, that the benefits of the manufacturer's research are passed on to the taxpayer in the maximum return for the least expenditure of funds. The future practice of independent professional engineering will be concerned, therefore, more and more with fair and effective competition. Eliminate competition in public works and you eliminate the independent engineer.

"The preparation of plans and specifications for fair and effective competition is no simple task. With the tremendous advancement in technical knowledge and in the art of water and sewage treatment, it would be a very unusual circumstance wherein selection was limited to one make of equipment, or to one process. How open shall specifications be? Shall the door be wide open to admit all, or so tightly closed as to eliminate all but one? Experience has shown that technical perfection must be balanced with reasonable cost. Somewhere between the extremes lies the desirable specification which gives the engineer equipment and materials satisfactory for the purposes intended and at the same time preserves the valuable influences of fair and effective competition.

"The contractor should have sufficient information in the specifications clearly to afford him an open market, and when he secures quotations from manufacturers he should, first, be reasonably certain that such products will be acceptable. Ambiguity involves risks which result in higher prices, inferior products and controversy. The manufacturer, when quoting, should know clearly from the specifications that to obtain the order he must sharpen his pencil; and, that price will be the basis of award. Fairness of opportunity will stimulate bidding, improve production, reduce marketing expense, and result in the most equitable prices to all concerned.

"Controversial items should be decided before bidding and clarified in the specifications rather than left as a risk and uncertainty in bidding. Size of project permitting, contracts for major equipment should be *direct with the manufacturer,* to insure maximum responsibility and minimum cost.

"As to methods of preparing specifications—two common methods of specifying equipment are by detailed description sufficiently broad to include features common to recognized manufacturers in the same class or by combination of description and the mention of three or more names of manufacturers as standards. In the first instance it is difficult in a rapidly changing market to anticipate patented features which tend to limit competition. The mention of names of manufacturers *as standards* has an advantage of portraying a positive opportunity for competition. However, a sufficient number of mutually competitive firms must be mentioned, and unless two or more names can be stated, it is better to rely upon descriptive specifications. Even when clearly stated that it is to be used only as a standard, the mention of only one name usually impairs competition seriously.

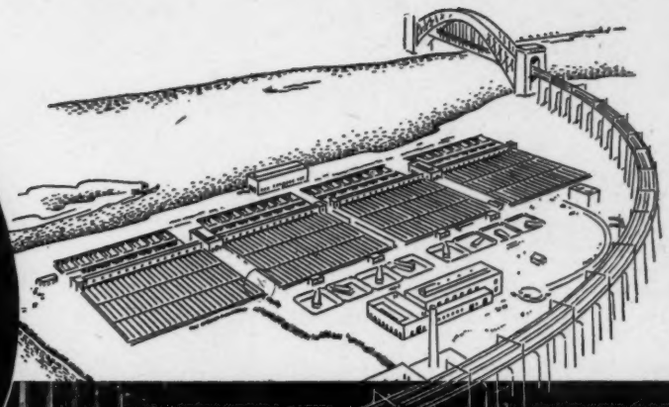
"In certain instances patented apparatus and treatment methods are such that to obtain competition it is necessary to resort to alternate proposals. In such cases the engineer should draw complete plans and specifications clearly to define the alternate method, process or apparatus. Price bid must determine the award with all other considerations clearly covered in the specifications. Frequently initial cost, however, is not the major consideration, and variations in operating cost affect the ultimate economy. If operating cost, or expectancy in respect to useful service-life, is to be considered in the award a definite basis for computing ultimate economy during a period of service should be clearly outlined in the specifications and set forth in the proposal. In order to protect against an irresponsible quotation on operating cost it is desirable to require a bond for performance to be determined by carefully specified tests.

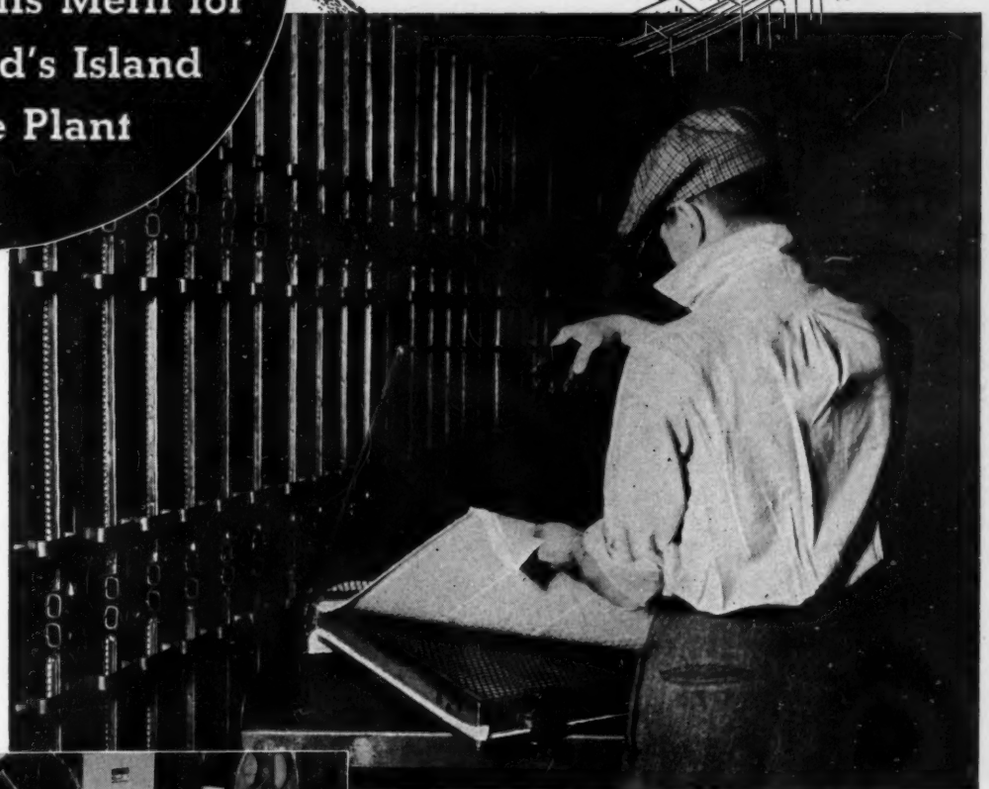
"Fair and effective competition possesses the following attributes. To the engineer it affords the very basis of his existence, and the opportunity for independent practice with high respect and regard of the public; to the contractor, freedom of opportunity and a reward for efficiency; to the manufacturer, independence in business and marketing, and a stimulus to improve products and develop new and better methods; and, to the taxpayer dollars and cents in economical public works."

These are the expressions of Engineer Velz which we do not feel could be better stated.

Everdur Metal

Selected on its Merit for Huge Ward's Island Sewage Plant

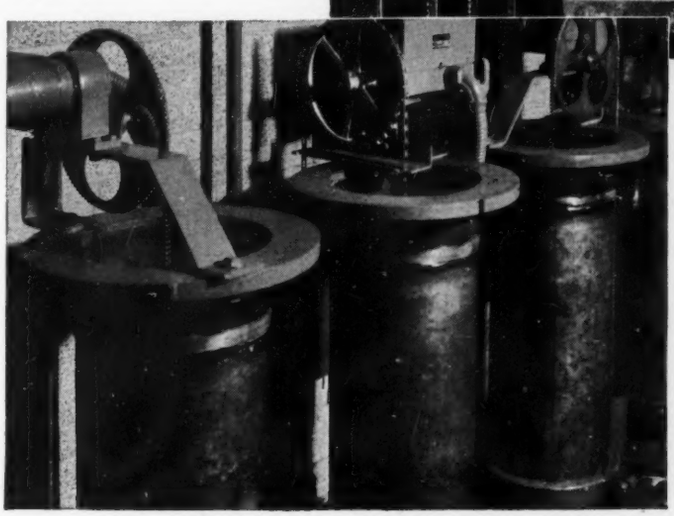




RIGHT—*Air filter of secondary room. Framework of filter structure, holders and mesh are welded and bolted Everdur Sheet and Strip. Fabricated by American Air Filter Co., Inc.*

• • •

BELOW—*Control mechanism of 12" diameter Everdur float tubes. Designed by Krajewski-Pesant Mfg. Corp.*



EVERDUR Copper-Silicon Alloy, selected for Ward's Island Sewage Disposal Plant, has an enviable record of successful service in the sewage, reservoir and water works field.

Since 1927 this Anaconda Metal, rustless as copper and steel-like in strength, has proved its dependability in the form of screens, gates, aprons, weirs, bolts, etc., under severely corrosive conditions.

It is readily workable, machinable and weldable, and its availability in all commercial forms makes possible the use of light-weight wrought shapes for strong and durable built-up structures. Write for Publication E-11 for detailed information. 8223

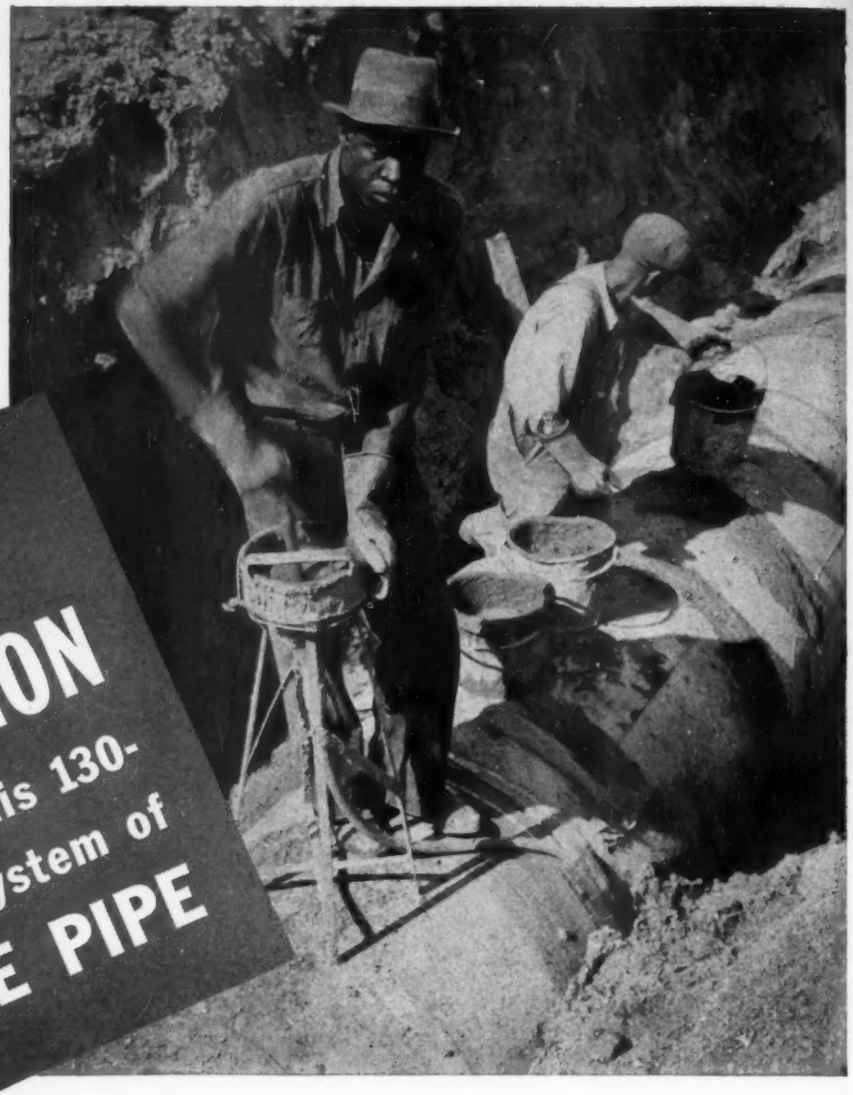
Everdur Metal

ANACONDA
from mine to consumer

THE AMERICAN BRASS COMPANY, General Offices: WATERBURY, CONNECTICUT

Offices and Agencies in Principal Cities • In Canada: ANACONDA AMERICAN BRASS LTD., New Toronto, Ont.

EVERDUR is a trade-mark of The American Brass Company, registered in the United States Patent Office.



Making the cement mortar joints on a 36-in. reinforced concrete pipe sanitary interceptor, Arlington County, Virginia. Work conducted under Roy S. Braden, county manager; Chester, Laboon, Campbell, Davis & Bankson of Pittsburgh, consulting engineers.

LOW INFILTRATION

...a feature of this 130-mile sewerage system of CONCRETE PIPE

ARLINGTON COUNTY, VIRGINIA, just across the Potomac from Washington, secured a PWA loan and grant to build a $2,500,000 sewerage system. Included in the project were over 100 miles of concrete pipe lateral sewers and 30 miles of concrete pipe interceptors ranging in diameter from 10 in. to 42 in.

Typical sections of pipe lines, including manholes, were given rigid infiltration tests before the system was paid for. As a result of using concrete pipe, with proper foundations in yielding soils, and with carefully made portland cement mortar joints . . . infiltration tested as low as 600 and up to 6,000 gallons, averaging only 2,500 gallons per mile per day. This is considered very low for the conditions.

Whether your sewers are a few inches or many feet in diameter, remember that concrete pipe minimizes infiltration and leakage . . . is strong and durable . . . resists corrosion . . . is moderate in first cost . . . and serves with little maintenance.

PORTLAND CEMENT ASSOCIATION

Dept. A6-29, 33 West Grand Avenue • Chicago, Ill.

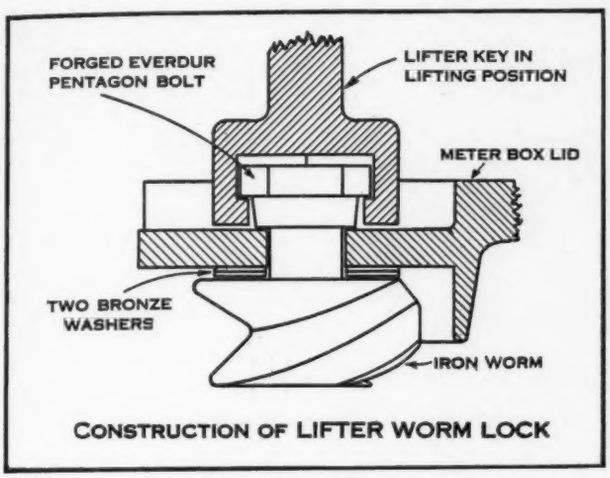
A National Organization to Improve and Extend the Uses of Concrete

EQUIPMENT NEWS

Meter Box Cover Has Lifting-Lock

The Worm-Lock on meter-box lids, pioneered by Ford in 1911 and since adapted by all makers of meter-boxes and similar equipment, is too well known to require any discussion of its merits.

Now The Ford Meter Box Company have added a worthy improvement which makes of the locking worm a lid lifting device in addition—so the name has been changed to the Ford Lifter Worm Lock, but we understand that there is no extra charge for this patented feature of the 1938 model Ford Covers.



Ford Meter Box Cover

This improved locking-lifting-closing device is the invention of a young operator, James A. Phillips, of Hopkinsville, Ky., who conceived the idea of the pentagonal nut and key which interlock when turning the key to unlock the lid and automatically disengages when the lock is turned closed.

What happens is this: The box key is slipped over the undercut pentagonal bolt head of the lifting lock; one tenth of a turn and it is engaged as a lifting handle; further turning brings the powerful lifting-worm into action and the cover is loose, to be picked up by the secured handle. The next feature of interest is the inability to leave the box cover unlocked, because the key can not be removed from the bolt-head until the worm has been completely turned to re-lock the cover in place. The key is then automatically released.

Ford claims are that meter readers save time, and also exertion on hard to open lids—also eliminated are dirty hands and smudgy meter book pages.

The worm is of heavy cast-iron, with two bronze washers between it and the iron lid. The pentagonal lock-lift nut and bolt are of forged "Everdur" alloy (98% copper), well known for its strength, toughness and resistance to corrosion.

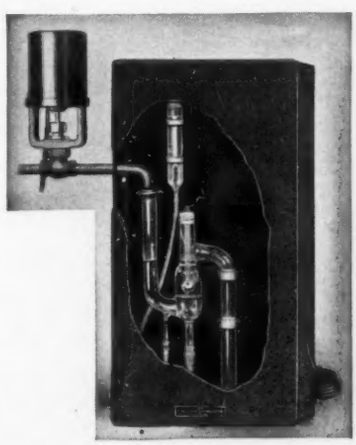
The improved lifting-lock is more completely described and illustrated in the new Ford Catalog. For a copy address The Ford Meter Box Co., Wabash, Ind.

Motorized Sampler for pH Control

Wilkens-Anderson Company of Chicago, have developed the WACO Motorized Sampler for securing pH readings, from one or several remote points, at a central station. In pH control of filter plant effluents and in sewage sludge dewatering the new sampler has decided possibilities.

The compact samplers contain glass electrodes, connected by wire to the Cameron pH Meter in the main laboratory or any central point—up to 500 ft. limit of wire run. To take a pH reading as frequently as desired, or at points selected, the operator closes the sampling circuit key; the sample is automatically drawn into the remote glass electrode chamber of the motorized sampler. It is then only necessary to make a single adjustment of the galvanometer needle (a feature of the Cameron Meter) to the zero position and read pH direct.

An interesting feature of the remote Motorized Sampler is that one pH Meter will serve many points—eliminating telephoning of results, or sending men for samples. Quick follow up pH readings can be had following adjustment changes. Another feature is the adaptability of *any* glass electrode with the Cameron Meter—

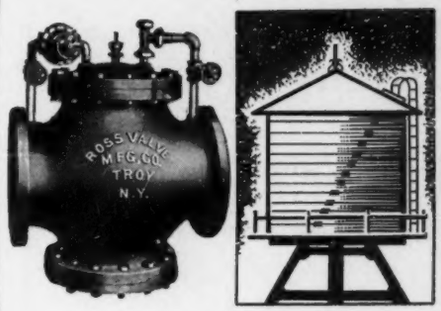


New Sampler for pH Control

For descriptive folder of the improved Cameron pH Meter and WACO Motorized Sampler write Wilkens-Anderson Co., 111 No. Canal St., Chicago, Ill.

FRESNO, CALIFORNIA

Utilizes



ELEVATED STORAGE

controlled by

"ROSS" ALTITUDE VALVE
ALL HYDRAULIC CONTROL
SIX AUTOMATIC OPERATIONS

Cycle of Operation

1 Opens to fill tank.

2 Closes to prevent overflow.

3 Opens to discharge to distribution—pre-adjusted distribution pressure.

4 Discharge as pressure reducing valve—for adjusted constant pressure.

5 When tank is half empty, valve opens wide, flow to distribution unrestricted.

6 Tank refilled with valve wide open to within 3 feet of top; valve closed to throttling position acting as relief or back pressure valve until tank is filled, when valve closes.

This method of control prevents dumping of the tank; retains supply on the off peak loads and makes available maximum storage for peak load periods.

RESULT

Better balanced pressure condition of system and power costs for pumpage reduced.

ROSS VALVE MFG. CO., Inc.
TROY, N. Y.

Manufacturers of Automatic Valves and Specialties.

COPPERAS
(FERROUS SULPHATE)
· · · FOR WATER & SEWAGE TREATMENT
(The Base For Chlorinated Copperas)

ALGAE CONTROL

Copper Sulphate has long been recommended by leading water works engineers, when slime, scum or other effects of algae and undesirable microorganisms give trouble. Easiest algicide to use, no special equipment or training required.

WE INVITE YOUR INQUIRIES

FAESY & BESTHOFF, INC.
22 E. 40th St. New York

WANTED
Sales Representatives

—MEN WHO KNOW THEIR WAY AROUND, who know what's going on in their territory, preferably with wide acquaintance among municipal, state, federal and health department officials.

Swimming Pool and Sewerage jobs are popping up everywhere. What we want is a few live wires who can hold on and close sales. For such wide-awake representatives we have an attractive proposition — a line that more than meets all competition — that includes low-priced chlorine sterilizing apparatus (9 types), for water works, sewage plants, swimming pools, dairies, etc., and a large variety of equipment for water treating and water sterilizing, that only need personal contact to close orders running from a few hundred to many thousands of dollars and full factory technical co-operation.

If you're the man we want, you'll know the volume of work of this type contemplated in your territory.

Write me personally for proposition stating territory you can cover and qualifications.

R. B. EVERSON, Pres.

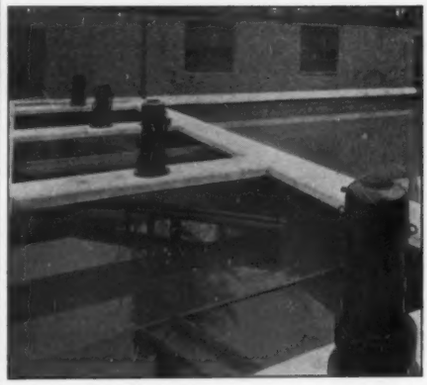
EVERSON MFG. CO.
"The Swimming Pool People"
233 W. Huron St., Chicago, U. S. A.

Permutit Floc Former

The Permutit Company, boasting more than 25 years' service in water treatment fields, have recently announced the Permutit Floc Former, providing two-stage mixing and flocculation.

The first stage involves a short high-speed (flash) mix for thorough chemical dispersion so conducive to chemical economy and efficiency in the second stage of slow-velocity floc building. The first stage involves 2 to 5 minutes at a paddle rotating speed determined as most efficient for the water or sewage treated. The second or "rolling mix" stage involves 20 to 60 minutes of turnover at speeds adjustable to most requirements and seasonal changes in such.

From the above illustration it is seen that the "Floc Former" employs vertical



The Floc Former

paddles with blades of the proper pitch to produce the valuable wavy floc rolling swirls. Also, to effect uniform velocities and displacement across the tank—something not attained with flat blades—submerged bearings carrying load are eliminated, the lower bearing being essentially a guide cup.

For a copy of "Permutit Floc Former" write Permutit Co., 330 W. 42nd St., New York City.

▼

Elon Hooker Passes—Hydraulic Engineer, Chlorine Manufacturer

Elon Huntington Hooker died on May 10th, while in California. He was president of the Hooker Electrochemical Company—one of America's largest manufacturers of chlorine and allied products, with plants at Niagara Falls, N. Y., and Tacoma, Washington.

Mr. Hooker was graduated by Cornell University as Civil Engineer. This profession he practiced for a time and was engaged on improvements to Boston's water supply; in an examination of the Panama Canal route; and, later, on the improved water supply system and new research laboratories for Cornell University.

In 1903 Mr. Hooker, seeing the possibilities in electrolytic production of chlorine and allied products, organized the Hooker Electrochemical Company and built its first plant at Niagara Falls. For 35 years he was active as president of his growing company, and also served three successive terms as president of the Manufacturing Chemists' Association of the United States. When he died he was 69 years old.

▼

P. R. Welch Joins Michigan Alkali

Michigan Alkali Company of Wyandotte, Mich., long established in the alkali field, have recently begun the manufacture of liquid chlorine.

P. R. Welch

In order to offer technical service in the sanitation field, Pierre R. Welch of Flint, Mich., has recently been employed by Michigan Alkali as technical service engineer.

Mr. Welch is a graduate chemist (1929), his alma mater being the University of Michigan. From 1929 to 1932 he was senior chemist at the sewage treatment plant of Flint, Mich., and since has served as chemist and plant superintendent. Interestingly, Mr. Welch was one of those to early see the possibilities of chlorine in bettering operating conditions at the Flint plant, and conducted original studies in chlorine applications and in other directions to benefit plant operation and enhance future design.

He early qualified as a class A licensed operator of sewage works and later as a licensed operator of water treatment plants. He is one of these practical minded experimentalists and a student with a background of training and experience which will serve him well in his new work.

▼

Bingham Heads New Columbia Sales Office

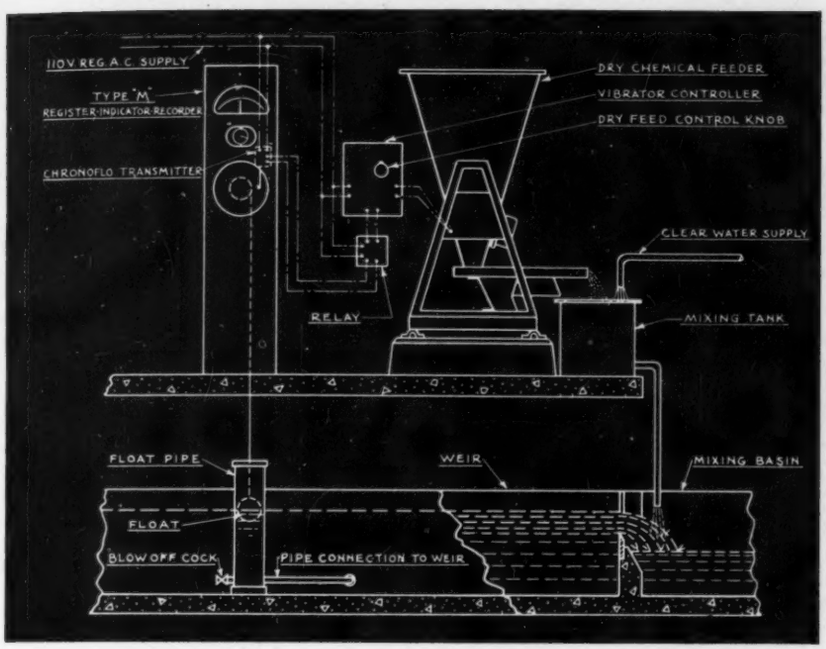
Chris. F. Bingham of the technical service department of the Columbia Alkali Corporation, has been made district manager of a new Columbia sales office in Philadelphia. The new office, located at 3033 North 16th Street, has jurisdiction over Pennsylvania, New Jersey, Delaware, Maryland, Virginia and the District of Columbia. This announcement was recently made by W. I. Galliher, director of sales.

Chris. F. Bingham

Mr. Bingham is well known as a chemical engineer, specializing in water works operation and sanitation. Until joining Columbia Alkali as technical service engineer he was plant manager at the Richmond, Va., filter plant. He is a graduate in chemical engineering of the Virginia Polytechnic Institute, and is a member of the American Water Works Association, the American Institute of Chemical Engineers, and other associations.

CHRONOFLO

"CHRONOFLO"—Trademark Registered U. S. Patent Office



Flow over weir (measured by Type M Register-Indicator-Recorder) controls feeding of dry chemical through connection with Chronoflo Transmitter and Power Units.

Automatic Chemical Feeding CONTROLLERS

In water and sewerage plants it is frequently necessary to feed chemicals in proportion to flow in Venturi Tubes, open flumes, or over weirs (see layout at left). For such service Chronoflo measuring devices, in connection with Chronoflo power units, actuate %Proportioneers' Tret-O-Units and Adjust-O-Feeders or standard make dry feeders.

By means of the Chronoflo transmitter, chemicals can be fed automatically in exact and selected proportion to flow. As distance makes no difference to the Chronoflo Transmitter, flow can be measured at one point and the chemical fed at another point in the system.

NEW BULLETIN 298

describes this and many other applications of the long distance Chronoflo Meter for water and sewerage systems.

BUILDERS IRON FOUNDRY, 9 CODDING STREET, PROVIDENCE, R. I.

70 YEARS OF LEADERSHIP

Since 1868

Have Established

FEATURES — VALUE — PRESTIGE

Manufacturers and Equipment Engineers of

WATER WORKS AND SEWAGE WORKS EQUIPMENT

Mechanical Aerators—Diffused Air Type
Motor Driven Rotary Distributors
Reaction Driven Rotary Distributors
Sludge Collecting Mechanisms
Sludge Pumps—Comminuting Type
Sewage Pumps—Non-clogging Type
Double Suction Centrifugal Pumps
Deep Well Turbine Pumps

THE AMERICAN WELL WORKS

General Office and Plant
AURORA, ILLINOIS
Branches in all principal cities.

EASILY—ECONOMICALLY

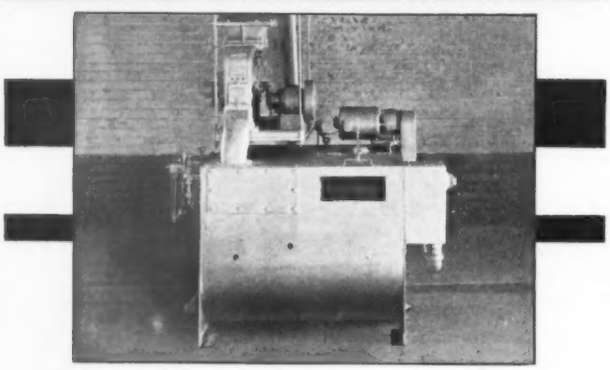
P.Q. SILICATE in the treatment of water supplies produces a larger floc more rapidly. Plants operating with P.Q. Silicates report quicker settling with consequent increased filter capacity and clearer filter effluent.

If your capacity is lagging behind demand, investigate P.Q. Silicate of Soda. P.Q. Silicates are made by a company in business over a century.

PHILADELPHIA QUARTZ COMPANY
General Offices and Laboratory: 125 S. Third St., Phila., Pa.
Chicago Sales Office: 205 W. Wacker Drive. Stocks in 60 cities.
Sold in Canada by NATIONAL SILICATES LTD., Toronto, Ont.

PQ SILICATE OF SODA

INFILCO Continuous LIME FEEDER & SLAKER



SAVE—*By Using Quick Lime*

Quick lime—95% CaO—costs less than hydrated lime containing 72% CaO. This saving is yours with the Infilco Continuous Feeder and Slaker. Operation is dustless and vapors are automatically ejected. Vertical agitation assures uniformity of milk of lime mixture. Requires but little more space than a dry chemical feeder.

INTERNATIONAL FILTER CO.
59 E. Van Buren Street, Chicago

MEETINGS SCHEDULED:

June 22—MACOMB, ILL. (Elks Club).
Northwestern Water Plant Operators' Assn. W. S. Newell, Chief Operator, Macomb Water Works, Macomb, Ill.

June 23—WORCESTER, MASS. (Worcester Country Club).
New England Water Works Assn. (Spring Outing). Chairman, J. Herman Smith, P. O. Box 25, South Boston, Mass.

Aug. 17-19—WHEELING, W. VA. (Hotel Windsor).
Central States Section A.W.W.A. Sec'y, E. P. Johnson, 418 Flannery Bldg., Sta. 13, Pittsburgh, Pa.

Aug. 25-26—LEXINGTON, VA. (Hotel Robert E. Lee).
Virginia Section A.W.W.A. Sec'y, H. W. Snidow, State Dept. of Health, Richmond, Va.

Sept. 8—LEBANON, PA.
Pennsylvania Water Works Operators' Assn. Sec'y-Treas., I. M. Glace, 22 South 22nd Street, Harrisburg, Pa.

Sept. 12-13—CASPER, WYO. (Townsend Hotel).
Rocky Mountain Section A.W.W.A. Sec'y, B. V. Howe, State Office Bldg., Denver, Colo.

Sept. 13-16—BOSTON, MASS. (Hotel Statler).
New England Water Works Assn. (57th Annual Convention). Sec'y, Frank J. Gifford, 613 Statler Bldg., Boston, Mass.

Sept. 14-16—SAGINAW, MICH. (Bancroft Hotel).
Michigan Section A.W.W.A. Sec'y, M. N. Gerardy, Water Board Bldg., Detroit, Mich.
(Meeting Jointly with)
Sept. 14-16—**Michigan Conference Water Purification.** Sec'y-Treas., R. J. Faust, Michigan Dept. Health, Lansing, Mich.

Sept. 22-23—POUGHKEEPSIE, N. Y. (Nelson House).
New York Section A.W.W.A. Sec'y, R. K. Blanchard, 50 West 50th St., New York City.

Sept. 29-30—COLUMBUS, OHIO (Fort Hayes Hotel).
Ohio Conference Sewage Treatment. Sec'y, B. M. McDill, Dept. of Health, Columbus, Ohio.

Sept. 29-Oct. 1—MINNEAPOLIS, MINN. (Hotel not announced).
Minnesota Section A.W.W.A. Sec'y, R. M. Finch, 416 Flour Exchange, Minneapolis, Minn.

Oct. 2-5—NEW YORK CITY, N. Y. (Hotel Pennsylvania).
American Public Works Assn. (Congress). Executive-Director, Frank W. Herring, 1313 East 60th St., Chicago, Ill.

Oct. 6-7—WASHINGTON, D. C. (Hotel not announced).
Four States Section A.W.W.A. Sec'y, Carl A. Hechmer, Dept. Engr., Washington Suburban San. Distr., Hyattsville, Md.

Oct. 6-8—HARTFORD, CONN. (Bond Hotel).
New York State Sewage Works Assn. Sec'y, A. S. Bedell, State Board of Health, Albany, N. Y.
(Meeting Jointly with)
Oct. 6-8—**New England Sewage Works Assn.** Sec'y, F. W. Gilcreas, State Dept. of Health, Albany, N. Y.

Oct. 10-12—MILWAUKEE, WIS. (Hotel not announced).
Wisconsin Section A.W.W.A. Sec'y, Al A. Smith, City Hall, Madison, Wis.

Oct. 13-15—DESMOINES, IOWA (Hotel Fort DesMoines).
Missouri Valley Section A.W.W.A. Sec'y, Earl L. Waterman, University of Iowa, Iowa City, Ia.

Oct. 17-20—OKLAHOMA CITY, OKLA. (Hotel Biltmore).
Southwest Section A.W.W.A. Sec'y, L. A. Quigley, Supt. City Water Works, Fort Worth, Texas.

Oct. 19-21—ATLANTIC CITY, N. J. (Hotel Haddon Hall).
Pennsylvania Water Works Assn. Sec'y, Dr. F. Herbert Snow, 327 Telegraph Bldg., Harrisburg, Pa.

Oct. 25-28—KANSAS CITY, MO.
American Public Health Assn. Executive Secretary, Reginald M. Atwater, M.D., 50 West 50th St., New York City.
Conference of State Sanitary Engineers. Sec'y-Treas., R. E. Tarbett, U.S.P.H. Service, Washington, D. C. (Meeting Jointly with A.P.H.A.)

Oct. 26-29—RIVERSIDE, CALIF. (Mission Inn).
California Section A.W.W.A. Sec'y, Carl M. Hoskinson, Div. of Water, Sacramento, Calif.

Oct. 31-Nov. 2—GREENSBORO, N. C. (King Cotton Hotel).
North Carolina Section A.W.W.A. Sec'y-Treas., A. R. Hollett, Chapel Hill, N. C.

CATALOGS AND LITERATURE RECEIVED

[Any of the publications reviewed in this section can be secured from or through Water Works and Sewerage, if such be desirable.]

"Progress in Filter Plant Equipment" is the caption of a recent "Simplex" bulletin, which illustrates and analyzes advantages from adaptations of the proven Simplex Type "S" Rate Controller now designed for installation in vertical drop lines as well as horizontal effluent lines from filter units. Amongst the advantages listed for the vertical installation are: (1) Simplification in piping layout; (2) Savings in construction and installation costs; (3) Simplification of maintenance; (4) Reduction of unrecoverable head loss in the effluent line and controller, resulting in conservation of available operating heads; (5) Flexibility of installation.

In this same bulletin appears a brief description of the advantageous application of air-operation to filter table gauges (loss of head and rate of flow) which is an adaptation of the proven air-operation of indicating and recording instruments actuated by venturi and orifice meters. For Bulletin No. 54, write Simplex Valve & Meter Co., 68th and Lapland Sts., Philadelphia, Pa.

"Operation of the Chicago Combination Aerator-Clarifier" is a recent 23-page booklet produced by the Sewage Equipment Division of Chicago Pump Co. Especially is the booklet intended as a guide and hand-book on the operation of the Chicago Combination Aerator-Clarifier and Mechanical Aeration plants, based on experiences gained by the engineering field staff of the company. However, the context of this booklet includes much of a basic nature concerning the activated sludge process, in general, and its effective and economic manipulation. It goes into analytical methods and essential operating tests. At the end is a listing of suggested equipment for plant laboratory which is required for basic control testing, and another list for more extended testing. Also a list of reference books is appended. For the experienced operator as well as the newer operators there is much of interest in this worthy little booklet. One chapter is devoted to "Operating Hints and Aids." A copy may be had upon request to the Chicago Pump Co., 2300 Wolfram St., Chicago.

"Silicate of Soda in Corrosion Prevention" is a new technical bulletin from Philadelphia Quartz Co., well-known manufacturers of a diversified line of silicates of soda. The bulletin is in reality a reprint of an article from *Industrial and Engineering Chemistry* of March, 1938, by Dr. William Stericker, in which is related experiences in treatment of potable and industrial waters with silicate of soda, for control of corrosion. Quantities and kind of silicate to employ; methods of application; mechanism of the action; degrees of protection; efficacy reported, and case histories; costs of treatment; are amongst the items covered in Dr. Stericker's enlightening presentation.

When father was a boy

Even so short a time ago as our father's generation, there was still much localized resentment against installing "these damnfangled costly water systems". "If our water was good enough for my father to drink . . ." was heard in many a town meeting of that time.

Today, the typhoid rate of North America is the lowest in history . . . adequate confirmation that liquid chlorine is doing its job well.

Solvay's new "Big 3" Liquid Chlorine Service is designed to fulfil the requirements of modern water purification and sanitation systems. This service is not only designed for quick and convenient delivery of Liquid Chlorine. It is a service system upon which State and municipal authorities can depend for adequate supplies in times of emergency . . . upon which they can depend for advice and technical assistance when it is required.

Solvay Liquid Chlorine shipments are now routed from Syracuse, New York; Hopewell, Virginia; and Baton Rouge, Louisiana. Your inquiries on Solvay Liquid Chlorine are cordially solicited. Please write to the nearest branch office listed below.

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40 RECTOR STREET **NEW YORK, N. Y.**

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SOLVAY

TRADE MARK REG. U. S. PAT. OFF.

LIQUID CHLORINE

BETTER
pH CONTROL
WITH
HELLIGE COMPARATORS

HELLIGE glass color standards, *perpetually guaranteed against fading*, solve many pH problems once and for all. Available for all popular water tests. Write for Bulletin 612.

MADE in U. S. A.

HELLIGE, INC.
3718 Northern Blvd.
Long Island City
NEW YORK

Use P F T Equipment in Your Sewage Treatment Plant

Write for Latest Bulletins

PACIFIC FLUSH TANK COMPANY
Designers & Manufacturers of Sewerage and Sewage Treatment Equipment
4241 Ravenswood Ave. Chicago, Ill.
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This article deserves the attention of water treatment authorities and, particularly, those concerned with the production of "perfect" water for the most fastidious domestic or industrial user. For Bulletin No. 372, write Philadelphia Quartz Co., 125 South 3rd St., Philadelphia, Pa.

"SILIC-O-FEEDERS" is the newest name applied to one of the several types of proportioning chemical feeders manufactured by %Proportioners, Inc.% In a leaflet, just received, is announced the adaptation of the "SILIC-O-FEEDER" to the automatic and exact proportioning of alkaline silicate of soda solution to water for pH correction and corrosion control, by methods detailed in the Philadelphia Quartz Co. bulletin cited above. This feeder is capable of providing proportional feed to meet wide flow variations. In pressure systems it injects the silicate solution against pressures up to 125 lbs. per sq. inch. The feeder is guaranteed to avoid over or under treatment and insure maximum economy in use of the somewhat costly but effective silicate solution. For the leaflet "SILIC-O-FEEDER," write %Proportioneers, Inc.%, 9 Codding St., Providence, R. I.

"Liquid Chlorine—Its Preparation and Packaging," just received from Pennsylvania Salt Mfg. Co., is a bound reprint of a paper by L. L. Hedgepeth, of this company. The original appeared in the March, 1938, issue of the Journal of the New England Water Works Assn. The effectively illustrated article reveals modern practices in production, purification, packaging and safe handling of liquid chlorine used in water purification and sanitation. Under "Safe Handling," the paper tells what to do, and what *not* to do, to avoid operating troubles and preclude chlorine accidents. In addition, what to do in case of accidents. The suggestions are tied in with plant practices of the manufacturers who are member firms of The Chlorine Institute, which maintains a Safety Committee for the benefit of members and protection of the public. Examples of the cause of chlorine accidents are presented in the form of case histories, revealing why the accident occurred and how it could have been prevented. Aside from the interesting reading, operators and engineers will find Mr. Hedgepeth's paper worthy for its helpful suggestions aimed at safety. For a copy, write Pennsylvania Salt Mfg. Co., Philadelphia.

"The Universal (Improved) ROTAMETER" is described, and its construction and manipulation effectively picturized, in a new bulletin from Schutte & Koerting, of Phliadelphia. The "Rotameter," previously described in the "Equipment News" section of an earlier issue, is essentially a graduated tapered wall glass tube, set in a vertical position. The flow of gas or liquid through the tube lifts a small rotating float in proportion to flow velocity—the elevation of the rotor-float revealing the rate of flow on the calibrated tube scale. The design of the improved "Rotameter" incorporates a one piece frame, which replaces eight separate parts used in the earlier models. The new design accommodates a greater variation in possible connection arrangements (illustrated) and the glass metering tube can be removed for cleaning, or substituting a tube of different metering range, without disconnecting the "Rotameter" assembly. For Rotameter Bulletin 18-R (supplement 1), write Schutte & Koerting Co., Philadelphia.

"Centrifugal Pumps" is a new and handsomely done 52-page bulletin from Allis-Chalmers, of Milwaukee, who boast better than half a century of centrifugal pump building. In this richly illustrated bulletin, "A-C," pump features and claims to distinction in service records are outlined, with many and various typical installations pictured. Of interest to readers of WATER WORKS & SEWERAGE are the installations at Chicago's gigantic West Side Sewage Treatment Works; Pittsburgh's (160 mgd. cap.) Brilliant Water Pumping Station; Washington's Water Pumping Stations; Chicago's new (300 mgd. cap.) Cermak Water Pumping Station; Chicago's North Side (600 cfs. cap.) Sewage Treatment Works; Milwaukee's (60 mgd. cap.) Water Pumping Station; Detroit's low lift water supply pumps of 118,000 gpm. capacity, as being amongst the most important. The bulletin describes and pictures rubber-lined chemical pumps; recirculating pumps; portable pumps; large screw type drainage and sewage pumps, and many other types of "A-C" make, small and large. For Bulletin 1651-A, write Allis-Chalmers Mfg. Co., Milwaukee, Wisc.

"The New Walworth Catalog" is a 602-page edition covering the complete line of Walworth valves, fittings, pipe and tools, just published. Several new features of the catalog should render it of increased usefulness to engineers, contractors, plant superintendents, and others. In the center, for instance, is a red index permitting quick reference to each class of product listed in the book. Arrows on the index pages point to the section markers at the beginning of each classified section. Among the new sections not contained in previous Walworth catalogs are: the Lubricated Plug Valve Section, with recommendations as to the types of lubricants best suited to them; the Wal-seal Section; the Hi-Test Cast Iron Pipe Section; the Fabricated Pipe Section, containing information of value in laying out piping jobs; the Piping Design and Engineering Data Section, including many original charts helpful in figuring the sizes and types of piping necessary for particular operating conditions. The Materials Section contains information concerning all types of metals used in Walworth products, complete data regarding working pressures as well as test pressures; and, all the principal dimensions normally required either for laying out a job or allowing necessary space for proper operation of the valves. Conservation of supply in the beginning makes it necessary to offer copies of Walworth Catalog No. 89 only to those who request them on their city, company or firm letterhead. Address the Walworth Co., 60 East 42nd St., New York, N. Y.

"The Aluminum Paint Manual" is a 100-page production of the Aluminum Company of America, to serve as a guide to paint users. Specifically, it is a manual on the preparation and application of aluminum paints, the proper grades of aluminum powder and vehicle to employ for various purposes—out and indoor, under a variety of atmospheric conditions. It constitutes a valuable and important guide in the proper preparation of the surface (wood, concrete, metal, brick, etc.) on which the aluminum paint is to be applied. Its chief purpose is to assist all users of aluminum paints to secure the most satisfactory and effective paint job. For "The Aluminum Paint Manual," write the Aluminum Company of America, Pittsburgh, Pa.

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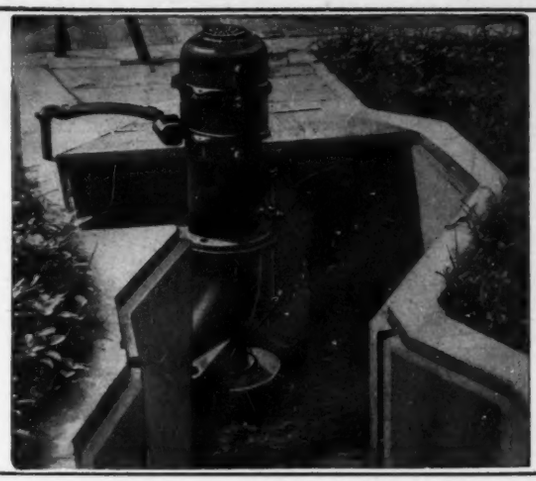

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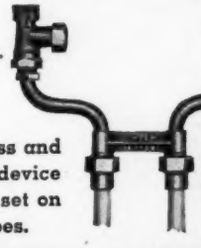

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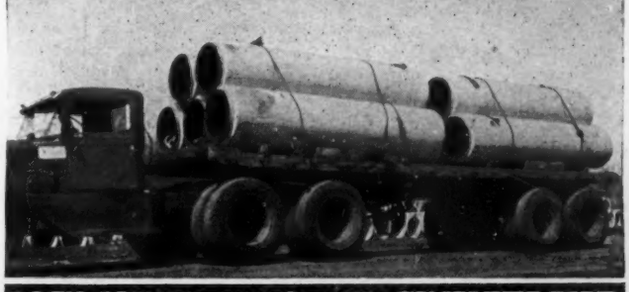

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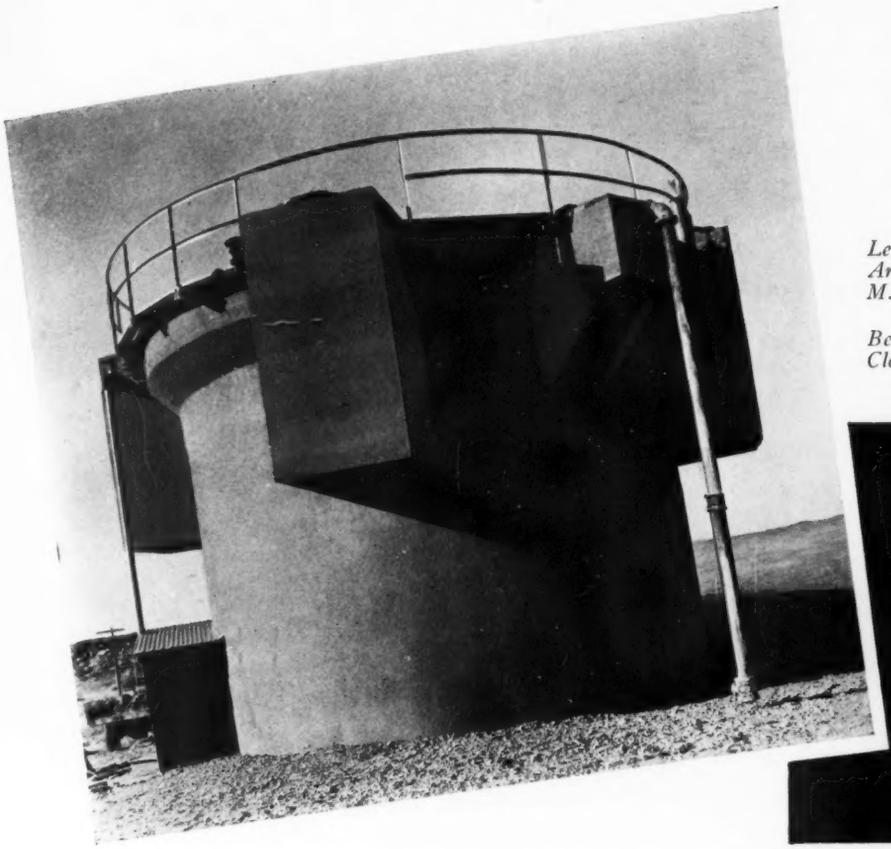

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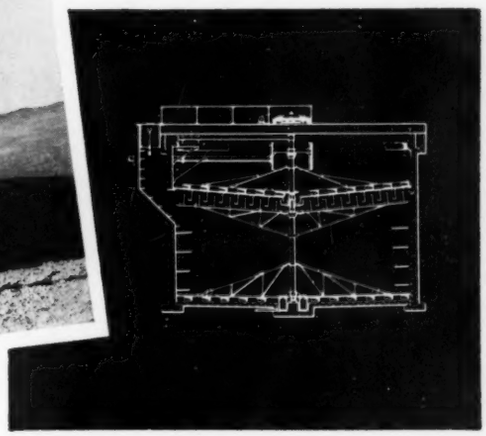
Left: 23 ft. Dorr Clarigester at Holbrook, Ariz. Population 1115, design flow 0.2 M.G.D.

Below: Sectional side view of a Dorr Clarigester.



COMPLETE PRIMARY TREATMENT IN A SINGLE TANK

DORR CLARIGESTER ADVANTAGES

No scum or foam, due to direct release of gas.

Sludge treated by sewage gas for rapid digestion and gasification.

All solids handled mechanically; no manual squeegeeing of slopes.

Less costly to build because of less volume and simpler tank construction.

Better appearance and easier to operate and control.

One tank does same work as two; one point of feed, overflow and discharge.

One motor drive unit, no interconnecting pipes, no valves to manipulate.

THE Dorr Clarigester* is in essence a mechanical Imhoff tank for small sewage treatment plants. In the top compartment, modern mechanical clarification. In the lower, separate sludge digestion under controlled conditions.

If primary treatment alone is sufficient, the Dorr Clarigester **is** the sewage plant. If secondary treatment must also be provided, the Dorr Clarigester is the ideal step ahead of trickling filters, activated sludge or chemical precipitation.

Diameters range from 10 to 40 ft.; depths from 11 to 23 ft. Here, in a nut shell, are all the big plant standards of sedimentation and separate digestion scaled down for communities with populations in the 1,000 to 7,000 range.

Write now to our nearest office for our new bulletin on "Dorr Clarigesters," complete with specifications and design information.

**A copyrighted name, denoting a combination clarifier and digester.*

THE DORR COMPANY INC.

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AUSTRALIA: Crossle & Duff Pty. Ltd., Melbourne
SOUTH AFRICA: Edward L. Bateman Pty. Ltd., Johannesburg
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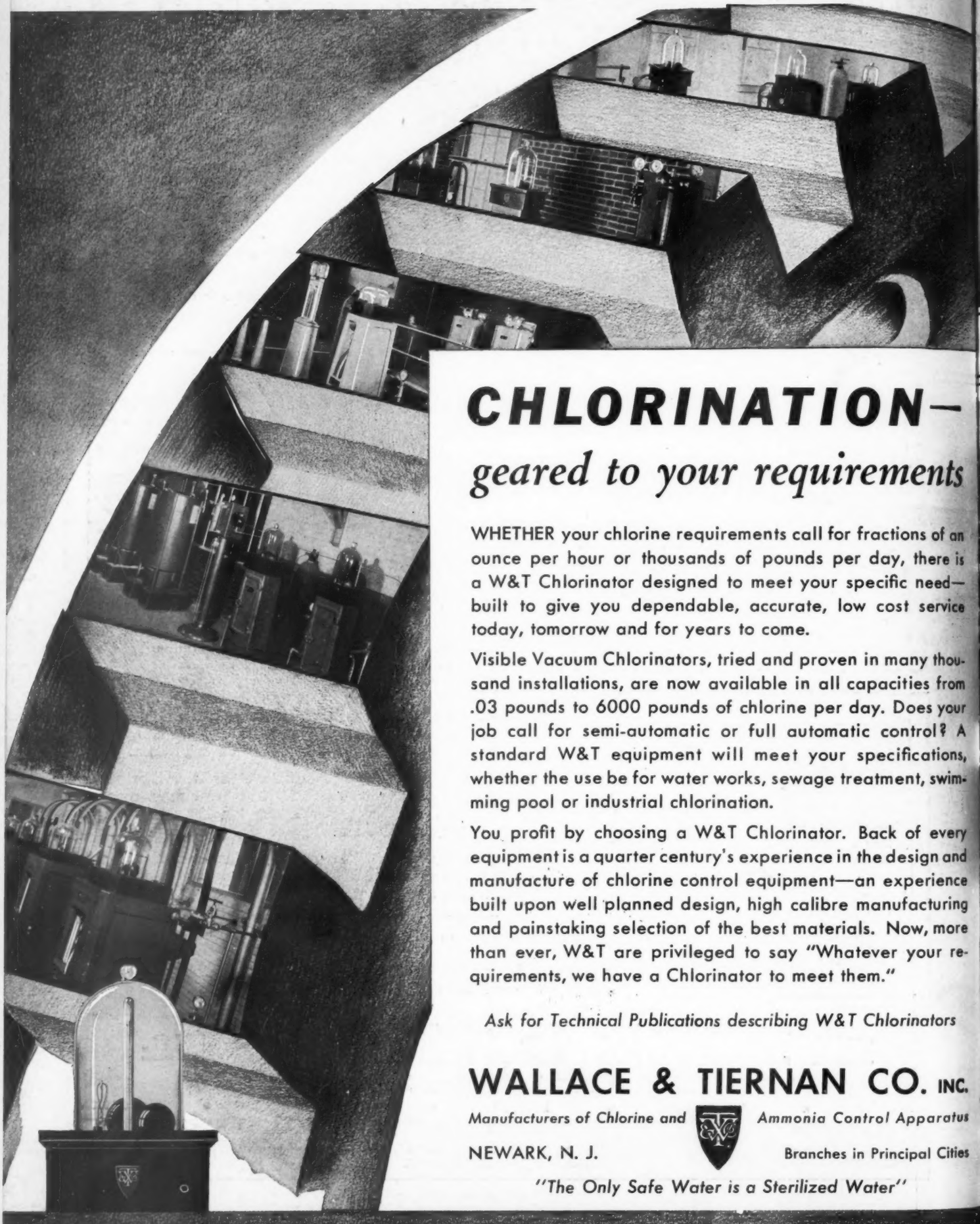
REAL VALUE FOR YOUR CHLORINATION DOLLAR



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geared to your requirements

WHETHER your chlorine requirements call for fractions of an ounce per hour or thousands of pounds per day, there is a W&T Chlorinator designed to meet your specific need—built to give you dependable, accurate, low cost service today, tomorrow and for years to come.

Visible Vacuum Chlorinators, tried and proven in many thousand installations, are now available in all capacities from .03 pounds to 6000 pounds of chlorine per day. Does your job call for semi-automatic or full automatic control? A standard W&T equipment will meet your specifications, whether the use be for water works, sewage treatment, swimming pool or industrial chlorination.

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